



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/US99/28528 (22) International Filing Date: 02 December 1999 (02.12.1999) (30) Priority Data: 09/204,888 03 December 1998 (03.12.1998) US 09/205,119 03 December 1998 (03.12.1998) US 09/205,653 03 December 1998 (03.12.1998) US (60) Parent Application or Grant TELECOM PARTNERS LTD. [/]; O. ELDERING, Charles, A. [/]; O. SYLLA, M., Lamine [/]; O. ELDERING, Charles, A. [/]; O. SYLLA, M., Lamine [/]; O. BLASKO, John, P. ; O.		Published
(54) Title: SUBSCRIBER CHARACTERIZATION AND ADVERTISEMENT MONITORING SYSTEM (54) Titre: SYSTEME DE DETERMINATION D'UN PROFIL D'ABONNE ET DE SURVEILLANCE PUBLICITAIRE (57) Abstract <p>A subscriber characterization and advertisement monitoring system (100) is presented in which subscriber viewing habits are monitored to determine demographic profiles. These profiles can be utilized for the matching of advertisements to subscribers based on their viewing habits and estimated demographics and product interests. The system (100) can be run locally in a television set-top (1808) or can be run in client server mode where channel selections are transmitted from the residence (1800) to a centralized switching location (server) (1840) such as a telephone office or Internet Service Provider. In client-server mode the channel selections are monitored at the centralized location (1840) which also performs the subscriber characterization. The system also provides the ability to monitor if advertisements were viewed and for what duration.</p> (57) Abrégé <p>L'invention concerne un système de détermination de profil d'abonné et de surveillance publicitaire (100), dans lequel on contrôle les publicités qu'un abonné regarde, afin de déterminer des profils démographiques. On peut utiliser ces profils pour faire correspondre les publicités destinées à des abonnés en fonction de ce qu'ils regardent, l'évaluation des données démographiques, et l'intérêt présenté par un produit. Le système (100) peut être mis en application localement dans un appareil de télévision (1808), ou peut être utilisé en mode serveur-client, les sélections de chaînes étant transmises de la résidence (1800) vers l'emplacement de commutation (1840) centralisée (serveur), tel qu'un central téléphonique ou un fournisseur de services Internet. En mode serveur-client, les sélections de chaînes sont contrôlées au niveau de l'emplacement de commutation (1840) centralisé, ce mode déterminant également le profil d'abonné. Le système permet également de contrôler si les publicités sont regardées et pendant combien de temps.</p>		

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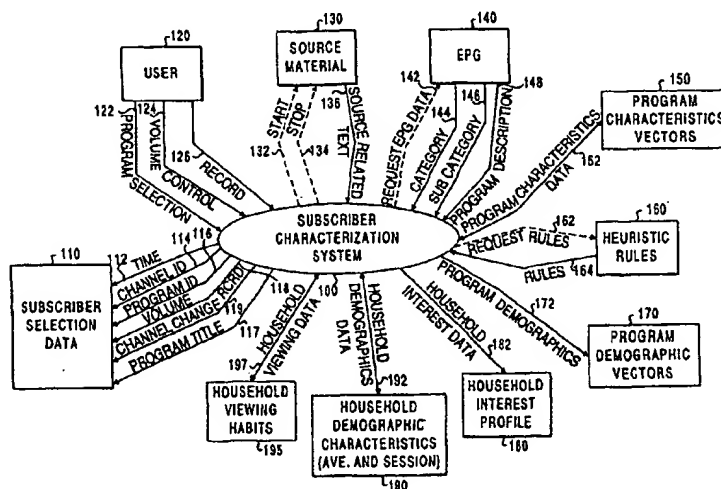
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(54) Title: SUBSCRIBER CHARACTERIZATION AND ADVERTISEMENT MONITORING SYSTEM



(57) Abstract

A subscriber characterization and advertisement monitoring system (100) is presented in which subscriber viewing habits are monitored to determine demographic profiles. These profiles can be utilized for the matching of advertisements to subscribers based on their viewing habits and estimated demographics and product interests. The system (100) can be run locally in a television set-top (1808) or can be run in client server mode where channel selections are transmitted from the residence (1800) to a centralized switching location (server) (1840) such as a telephone office or Internet Service Provider. In client-server mode the channel selections are monitored at the centralized location (1840) which also performs the subscriber characterization. The system also provides the ability to monitor if advertisements were viewed and for what duration.

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Description

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TITLE

Subscriber characterization and
advertisement monitoring system

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Background of the Invention

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5 The user can indicate the amount of advertisements in the
set of advertisements he wants to view.

10 While advertisements are sometimes beneficial to
subscribers and deliver desired information regarding
5 specific products or services, consumers generally view
advertising as a "necessary evil" for broadcast-type
entertainment. For example, a method for obtaining
information on advertised services or products is described
15 in U.S. Patent No. 5,708,478, which discloses a computer
system for enabling radio listeners and television watchers
20 to obtain advertising information. The system includes steps
of determining whether an incoming video or audio signal
includes advertisement specific data of an advertiser and
capturing and storing the advertiser specific data.

15 Manufacturers pay an extremely high price to present,
in 30 seconds or less, an advertisement for their product,
25 which they hope a consumer will watch. Unfortunately for the
manufacturer, the consumer frequently uses that interval of
time to check the programming being presented on the other
30 channels, and may not watch any of the advertisement.
Alternately, the consumer may mute the channel and ignore
what the manufacturer has presented. In any case the
probability that the consumer has watched the advertisement
35 is quite low. It is not until millions of dollars have been
spent on an advertising campaign that a manufacturer can
25 determine that the ads have been effective. This is
presently accomplished by monitoring sales of the product or
TV programs or channels viewed by users as disclosed in
40 various public documents. As an example, U.S. Patent No.
30 4,546,382 discloses a television and market research data
collection system and method. A data collection unit
45 containing a memory stores data as to which of the plurality
of TV modes are in use, which TV channel is being viewed as
well as input from a suitable optical scanning device for
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collecting information about user's product purchases. Another system described in U.S. Patent No. 4,258,386 discloses a television audience measuring system. The system monitors and stores information representative of channel identification, the time at which the channel is selected and the time at which the selection of a channel is terminated. U.S. Patent No. 5,608,445 discloses also a method and device for data capture in television viewer research. Devices are attached to a video installation in order to determine to which channel a set is tuned.

With the advent of the Internet manufacturers and service providers have found ways to selectively insert their advertisements based on a subscribers requests for information. As an example, an individual who searches for "cars" on the Internet may see an advertisement for a particular type of car. Various internet-based advertising use this method. The product literature from IMGIS Inc., "Ad Force," printed from the World Wide Web site http://www.starpt.com/core/ad_Target.html on June 30, 1998 discloses an ad targeting system. The system delivers ads to web sites visitors based on the content of the web page, time of day, day of the week, keyword, by the number of times a visitor sees an advertisement and by the order in which a series of advertisements are shown to a visitor. Nevertheless, unless the subscriber actually goes to the advertised web site, there is no way to determine if the advertisement has been watched. As the content on the Internet migrates to multimedia programming including audio and video, the costs for the advertising will increase, but unless the advertiser can be sure that a significant percentage of the message was watched or observed, the advertising is ineffective. Prior art products for generating reports of ad campaign are generally PC-centric as described in various product literature which include the

5 product literature from DoubleClick Inc., "DoubleClick:
Reporting," printed from the World Wide Web (WWW) site
http://www.doubleclick.net/dart/howi_repo.htm on June 19,
1998, which discloses the reporting capabilities of
10 DoubleClick's Dynamic Advertising Reporting & Targeting
(DART) product. The information in the reports includes
daily impressions by advertisement type, average impression
per day of week and by hour of day. The average response
15 rate per user is also included in the reports. The product
literature from Netgravity Inc. "AdServer 3," printed from
the World Wide Web site http://www.netgravity.com/products/
on July 9, 1998 discloses Netgravity's Adserver 3 product
20 for online advertisement. The product generates reports
including the profiles of visitors who viewed an ad and site
15 traffic throughout the day, week, month and year.

25 The product literature from Media Metrix "Frequently
Asked Questions", printed from the World Wide Web site
http://www.mediametrix.com/interact_mmfaq.htm on June 30,
1998 discloses Media Metrix software, PC Meter, that runs in
30 the background of a PC and monitors everything being done on
that machine. It determines who is using the PC by age,
income, gender and geographic region and tracks usage of
software application, commercial online services and
35 detailed page level viewing of the World Wide Web. The
marketing literature from Matchlogic Inc., "Centralized Ad
Management," printed from the World Wide Web site
40 http://www.matchlogic.com/docs/services2.htm on July 1, 1998
discloses Matchlogic services for ad management. The
services include delivering advertisements based on pre-
30 defined targeting criteria, generating reports on how many
45 unique viewers saw which banner and how many times it was
viewed. The product literature from Accipiter Inc.,
"Accipiter AdManager 2.0," printed from the World Wide Web
50 site http://www.accipiter.com/products/ADManager/fab.html on

July 9, 1998 discloses Accipiter's ad management system. After delivering an advertisement based on pre-defined criteria, the system can generate reports on an ad campaign. The reports include visitors' demographic data, number of impressions and clicks generated from the entire site and by each ad and advertiser.

In order to deliver more targeted programming and advertising to subscribers, it is necessary to understand their likes and dislikes to a greater extent than is presently done today. Systems which identify subscriber preferences based on their purchases and responses to questionnaires allow for the targeted marketing of literature in the mail, but do not in any sense allow for the rapid and precise delivery of programming and advertising which is known to have a high probability of acceptance to the subscriber. Other systems give users the possibility to chose their programming as described in U.S. Patent No. 5,223,924 which discloses a system and method for automatically correlating user preferences with a TV program information database. The system includes a processor that performs "free text" search techniques to correlate the downloaded TV program information with the viewer's preferences. This system requires an interaction between the users and the programming. The white paper from Net Perceptions corporation entitled "Adding Value in the Digital Age" and printed from the World Wide Web site <http://www.netperceptions.com/products/white-papers.html> on June 30, 1998 discloses how the GroupLens Recommendation Engine gives online businesses the ability to target and personalize services, content, products and advertising. A learning process learns personal information about an individual using explicit and implicit ratings, a prediction process predicts user preference using collaborative

filtering and the recommendation process recommends products
or services to users based on predictions.

The product literature from Aptex software Inc.,
"SelectCast for Commerce Servers," printed from the World
Wide Web site <http://www.aptex.com/products-selectcast-commerce.htm> on June 30, 1998 describes the product
SelectCast for Commerce Servers. It personalizes online
shopping based on observed user behavior. User interests are
learned based on the content they browse, the promotions
they click and the products they purchase.

In order to determine which programming or advertising
is appropriate for the subscriber, knowledge of that
subscriber and the subscriber product and programming
preferences is required. Different methods are being used to
gain knowledge of user's preferences and to profile the
users. Generally, these methods use content or data mining
technologies to profile users or predict their preferences.
Another technique for predicting user's preferences is based
on the use of collaborative filtering as described in U.S.
Patent No. 5,704,017 which discloses a collaborative
filtering system utilizing a belief network. The system
learns a belief network using prior knowledge obtained from
an expert in a given field of decision making and a database
containing empirical data such as users' attributes as well
as their preferences in that decision making field. The
belief network can determine the probability of the unknown
preferences of the user given the known attributes and thus
predicts the preference most likely to be desired by the
user.

The product literature from Aptex software Inc.,
"SelectCast for Ad Servers," printed from the World Wide Web
site <http://www.aptex.com/products-selectcast-ads.htm> on
June 30, 1998 discloses an ad targeting system from Aptex
Software Inc. The system employs neural networks and a

context vector data model to optimize relationships between users and content. It provides user profiling by mining the context and content of all actions including clicks, queries, page views and ad impressions. Aptex's technology uses a context vector data modeling technique described in U.S. Patent No. 5,619,709 which discloses a system and method of context vector generation and retrieval. Context vectors represent conceptual relationships among information items by quantitative means. A neural network operates on a training corpus of records to develop relationship-based context vectors based on word proximity and co-importance. Geometric relationships among context vectors are representative of conceptual relationships among their associated items.

The product Data sheet from Open Sesame, "Learn Sesame," printed from the World Wide Web site http://www.opensesame.com/prod_04.html on July 09, 1998 discloses Open Sesame's personalization product for Web enterprises. It learns about users automatically from their browsing behavior.

The product literature from Engage Technologies, "Engage.Discover," printed from the World Wide Web site <http://www.engagetechn.com> on July 09, 1998 discloses Engage Technologies' product for user profiling. User-disclosed information such as interest, demographics and opinions are combined with anonymous clickstream data that describes where users come from before visiting the site, how long they stay, and what pages or types of pages they visit most frequently to build the visitor profile.

The marketing literature from Broadvision, "The Power of Personalization", printed from the World Wide Web site <http://www.broadvision.com/content/corporate/brochure/Broch4.htm> on August 21, 1998 discloses BroadVision One-to-One application profiling system. The system learns about users

5 through a variety of techniques including registration,
questionnaires, observation and integration of historical
and externally generated data.

10 The marketing literature from Firefly Corporation,
5 "Firefly passport Office," printed from the World Wide Web
site <http://www.firefly.net/company/PassportOffice.html> on
June 20, 1998 discloses Firefly's Relationship Management
software. The software enables online businesses to create,
15 extend and manage personal profiles for every user.

20 Specific information regarding a subscriber's viewing
habits or the Internet web sites they have accessed can be
stored for analysis, but such records are considered private
and subscribers are not generally willing to have such
25 information leave their control. Although there are
regulatory models, which permit the collection of such data
on a "notice and consent" basis, there is a general tendency
towards legal rules, which prohibit such raw data to be
collected.

30 With the migration of services from a broadcast based
model to a client-server based model in which subscribers
make individualized request for programming to an Internet
access provider or content provider, there is opportunity to
35 monitor the subscriber viewing characteristics to better
provide them with programming and advertising which will be
of interest to them. A server may act as a proxy for the
subscriber requests and thus be able to monitor what a
40 subscriber has requested and is viewing. Since subscribers
may not want this raw data to be utilized, there is a need
for a system which can process this information and generate
statistically relevant subscriber profiles. These profiles
45 should be accessible to others on the network who may wish
to determine if their programming or advertisements are
suitable for the subscriber. In a broadcast-based model, the
information to be processed can be embedded within the TV

5 program or broadcast separately and can be in form of an
electronic program guide (EPG) or text information related
to the program. As an example, U.S. Patent No. 5,579,055
discloses an electronic program guide (EPG) and text channel
10 data controller. The text and EPG data are embedded in the
vertical blanking interval of the video signal and
extracted, at reception, by the data controller. The EPG
contains information fields such as program category,
15 program subcategory and program content description. U.S.
Patent No. 5,596,373 discloses also a method and apparatus
for providing program oriented information in a multiple
station broadcasting system. The EPG data includes guide
20 data, channel data and program data. The program data
includes among other information, the program title, the
program category, the program sub-category and a detailed
description of the program.

25 For the foregoing reasons, there is a need for an
advertisement monitoring system which can monitor which
advertisements have been viewed by a subscriber. There is
30 also a need for a subscriber characterization system which
can generate and store subscriber characteristics which
reflect the probable demographics and preferences of the
subscriber and household.

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Summary Of The Invention

40 The present invention encompasses a system for
determining to what extent an advertisement has been viewed
by a subscriber or household.

30 In a preferred embodiment subscriber selection data
45 including the channel selected and the time at which it was
selected are recorded. Advertisement related information
including the type of product, brand name, and other
descriptive information which categorizes the advertisement
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5 is extracted from the advertisement or text information
related to the advertisement including closed captioning
text. Based on the subscriber selection data a record of
what percentage of the advertisement was watched is created.

10 5 This record can subsequently be used to make a measure of
the effectiveness of the advertisement.

15 In a preferred embodiment the text information related
to the advertisement is processed using context mining
techniques which allow for classification of the
10 advertisement and extraction of key data including product
type and brand. Context mining techniques allow for
determination of a product type, product brand name and in
20 the case of a product which is not sold with a particular
brand name, a generic name for the product.

15 25 The present invention can also be realized in a client-
server mode in which case the subscriber executes channel
changes at the client side of the network which are
transmitted to the server side and fulfilled by the routing
of a channel to the subscriber. The server side monitors
30 20 the subscriber activity and stores the record of channel
change requests. Advertisement related information is
retrieved from the server side, which contains the
advertising material itself, retrieves the advertising
35 material from a third party, or analyzes the data stream
25 carrying the advertising to the subscriber. The server side
extracts descriptive fields from the advertisement and based
40 on the subscriber selection data, determines the extent to
which the advertisement was viewed by the subscriber. As an
example the system can determine the percentage of the
30 advertisement that was viewed by the subscriber.

45 The present invention includes a system for
characterizing subscribers watching video or multimedia
programming based on monitoring their detailed selection
50 choices including the time duration of their viewing, the

5 volume the programming is listened at, the program
selection, and collecting text information about that
programming to determine what type of programming the
subscriber is most interested in. In addition, the system
10 5 can generate a demographic description of the subscriber or
household which describes the probable age, income, gender
and other demographics. The resulting characterization
includes probabilistic determinations of what other
15 programming or products the subscriber/household will be
20 interested in.

In a preferred embodiment, the textual information
which describes the programming is obtained by context
20 mining of text associated with the programming. The
associated text can be from the closed-captioning data
15 associated with the programming, an electronic program
guide, or from text files associated with or part of the
25 programming itself.

The system can provide both session measurements which
correspond to a profile obtained over a viewing session, or
30 20 an average profile which corresponds to data obtained over
multiple viewing sessions.

The present invention also encompasses the use of
heuristic rules in logical form or expressed as conditional
35 probabilities to aid in forming a subscriber profile. The
25 heuristic rules in logical form allow the system to apply
generalizations which have been learned from external
40 studies to obtain a characterization of the subscriber. In
the case of conditional probabilities, determinations of the
probable content of a program can be applied in a
30 mathematical step to a matrix of conditional probabilities
45 to obtain probabilistic subscriber profiles indicating
program and product likes and dislikes as well for
determining probabilistic demographic data.

50 One advantage of the present invention is that it

5 allows consumers the possibility to permit access to
probabilistic information regarding their household
demographics and programming/product preferences, without
revealing their specific viewing history. Subscribers may
10 5 elect to permit access to this information in order to
receive advertising which is more targeted to their
likes/dislikes. Similarly, a subscriber may wish to sell
access to this statistical data in order to receive revenue
15 or receive a discount on a product or a service.

10 Another advantage of the present invention is that the
resulting probabilistic information can be stored locally
and controlled by the subscriber, or can be transferred to a
20 third party which can provide access to the subscriber
characterization. The information can also be encrypted to
15 prevent unauthorized access in which case only the
subscriber or someone authorized by the subscriber can
25 access the data.

The present invention includes also a system for
characterizing subscribers watching video or multimedia
30 20 programming based on monitoring the requests made by the
subscriber for programming to a server which contains the
content or which requests the content from a third party.
The server side of the network is able to monitor the
35 subscriber's detailed selection choices including the time
25 duration of their viewing, the volume the programming is
listened at, and the program selection.

40 The server side collects text information about that
programming to determine what type of programming the
subscriber is most interested in. In addition the system
30 45 can generate a demographic description of the subscriber or
household which describes the probable age, income, gender
and other demographics. The resulting characterization
includes probabilistic determinations of what other

programming or products the subscriber/household will be
interested in.

These and other features and objects of the invention
will be more fully understood from the following detailed
description of the preferred embodiments which should be
read in light of the accompanying drawings.

Brief Description of the Drawings

The accompanying drawings, which are incorporated in
and form a part of the specification, illustrate the
embodiments of the present invention and, together with the
description serve to explain the principles of the
invention.

In the drawings:

FIG. 1 shows a context diagram for a subscriber
characterization system.

FIG. 2 illustrates a block diagram for a realization of
a subscriber monitoring system for receiving video signals;

FIG. 3 illustrates a block diagram of a channel
processor;

FIG. 4 illustrates a block diagram of a computer for a
realization of the subscriber monitoring system;

FIG. 5 illustrates a channel sequence and volume over a
twenty-four (24) hour period;

FIG. 6 illustrates a time of day detailed record;

FIG. 7 illustrates a household viewing habits
statistical table;

FIG. 8A illustrates an entity-relationship diagram for
the generation of program characteristics vectors;

FIG. 8B illustrates a flowchart for program
characterization;

FIGS. 9A illustrates a deterministic program category
vector;

FIG. 9B illustrates a deterministic program sub-
category vector;

FIG. 9C illustrates a deterministic program rating
vector;

FIG. 9D illustrates a probabilistic program category
vector;

FIG. 9E illustrates a probabilistic program sub-
category vector;

FIG. 9F illustrates a probabilistic program content
vector;

FIG. 10A illustrates a set of logical heuristic rules;

FIG. 10B illustrates a set of heuristic rules expressed
in terms of conditional probabilities;

FIG. 11 illustrates an entity-relationship diagram for
the generation of program demographic vectors;

FIG. 12 illustrates a program demographic vector;

FIG. 13 illustrates an entity-relationship diagram for
the generation of household session demographic data and
household session interest profiles;

FIG. 14 illustrates an entity-relationship diagram for
the generation of average and session household demographic
characteristics;

FIG. 15 illustrates average and session household
demographic data;

FIG. 16 illustrates an entity-relationship diagram for
generation of a household interest profile;

FIG. 17 illustrates household interest profile
including programming and product profiles;

FIG. 18 illustrates a client-server architecture for
realizing the present invention; and

FIG. 19 illustrates an advertisement monitoring table.

Detailed Description
Of The Preferred Embodiment

In describing a preferred embodiment of the invention illustrated in the drawings, specific terminology will be used for the sake of clarity. However, the invention is not intended to be limited to the specific terms so selected, and it is to be understood that each specific term includes all technical equivalents which operate in a similar manner to accomplish a similar purpose.

With reference to the drawings, in general, and FIGS. 1 through 19 in particular, the apparatus of the present invention is disclosed.

The present invention is directed at an apparatus for monitoring which advertisements are watched by a subscriber or a household.

In the present system the programming viewed by the subscriber, both entertainment and advertisement, can be studied and processed by the subscriber characterization system to determine the program characteristics. This determination of the program characteristics is referred to as a program characteristics vector. The vector may be a truly one-dimensional vector, but can also be represented as an n dimensional matrix which can be decomposed into vectors. For advertisements, the program characteristics vector can contain information regarding the advertisement including product type, features, brand or generic name, or other relevant advertising information.

The subscriber profile vector represents a profile of the subscriber (or the household of subscribers) and can be in the form of a demographic profile (average or session) or a program or product preference vector. The program and product preference vectors are considered to be part of a household interest profile which can be thought of as an n dimensional matrix representing probabilistic measurements

of subscriber interests.

5 In the case that the subscriber profile vector is a
demographic profile, the subscriber profile vector indicates
a probabilistic measure of the age of the subscriber or
5 average age of the viewers in the household, sex of the
10 subscriber, income range of the subscriber or household, and
other such demographic data. Such information comprises
household demographic characteristics and is composed of
15 both average and session values. Extracting a single set of
10 values from the household demographic characteristics can
correspond to a subscriber profile vector.

20 The household interest profile can contain both
programming and product profiles, with programming profiles
corresponding to probabilistic determinations of what
15 programming the subscriber (household) is likely to be
25 interested in, and product profiles corresponding to what
products the subscriber (household) is likely to be
interested in. These profiles contain both an average value
and a session value, the average value being a time average
30 of data, where the averaging period may be several days,
20 weeks, months, or the time between resets of unit.

35 Since a viewing session is likely to be dominated by a
particular viewer, the session values may, in some
circumstances, correspond most closely to the subscriber
25 values, while the average values may, in some circumstances,
correspond most closely to the household values.

40 FIG. 1 depicts the context diagram of a preferred
embodiment of a Subscriber Characterization System (SCS)
100. A context diagram, in combination with entity-
30 relationship diagrams, provide a basis from which one
45 skilled in the art can realize the present invention. The
present invention can be realized in a number of programming
languages including C, C++, Perl, and Java, although the
scope of the invention is not limited by the choice of a
50

5 particular programming language or tool. Object oriented
languages have several advantages in terms of construction
of the software used to realize the present invention,
although the present invention can be realized in procedural
10 or other types of programming languages known to those
skilled in the art.

In generating a subscriber profile, the SCS 100
receives from a user 120 commands in the form of a volume
15 control signal 124 or program selection data 122 which can
be in the form of a channel change but may also be an
address request which requests the delivery of programming
from a network address. A record signal 126 indicates that
20 the programming or the address of the programming is being
recorded by the user. The record signal 126 can also be a
printing command, a tape recording command, a bookmark
15 command or any other command intended to store the program
being viewed, or program address, for later use.

The material being viewed by the user 120 is referred
to as source material 130. The source material 130, as
30 defined herein, is the content that a subscriber selects and
may consist of analog video, Motion Picture Expert Group
(MPEG) digital video source material, other digital or
analog material, Hypertext Markup Language (HTML) or other
35 type of multimedia source material. The subscriber
characterization system 100 can access the source material
25 130 received by the user 120 using a start signal 132 and a
stop signal 134, which control the transfer of source
related text 136 which can be analyzed as described herein.

In a preferred embodiment, the source related text 136
30 can be extracted from the source material 130 and stored in
memory. The source related text 136, as defined herein,
includes source related textual information including
descriptive fields which are related to the source material
130, or text which is part of the source material 130

5 itself. The source related text 136 can be derived from a
number of sources including but not limited to closed
captioning information, Electronic Program Guide (EPG)
material, and text information in the source itself (e.g.
5 text in HTML files).

10 Electronic Program Guide (EPG) 140 contains information
related to the source material 130 which is useful to the
user 120. The EPG 140 is typically a navigational tool
15 which contains source related information including but not
limited to the programming category, program description,
rating, actors, and duration. The structure and content of
EPG data is described in detail in US Patent 5,596,373
20 assigned to Sony Corporation and Sony Electronics which is
herein incorporated by reference. As shown in FIG. 1, the
15 EPG 140 can be accessed by the SCS 100 by a request EPG data
signal 142 which results in the return of a category 144, a
25 sub-category 146, and a program description 148. EPG
information can potentially include fields related to
advertising.

30 20 In one embodiment of the present invention, EPG data is
accessed and program information such as the category 144,
the sub-category 146, and the program description 148 are
stored in memory.

35 In another embodiment of the present invention, the
25 source related text 136 is the closed captioning text
embedded in the analog or digital video signal. Such closed
captioning text can be stored in memory for processing to
40 extract the program characteristic vectors 150.

One of the functions of the SCS 100 is to generate the
30 program characteristics vectors 150 which are comprised of
program characteristics data 152, as illustrated in FIG. 1.
45 The program characteristics data 152, which can be used to
create the program characteristics vectors 150 both in
vector and table form, are examples of source related
50

5 information which represent characteristics of the source material. In a preferred embodiment, the program characteristics vectors 150 are lists of values which characterize the programming (source) material in according
10 to the category 144, the sub-category 146, and the program description 148. The present invention may also be applied to advertisements, in which case program characteristics vectors contain, as an example, a product category, a product sub-category, and a brand name.

15 As illustrated in FIG. 1, the SCS 100 uses heuristic rules 160. The heuristic rules 160, as described herein, are composed of both logical heuristic rules as well as heuristic rules expressed in terms of conditional probabilities. The heuristic rules 160 can be accessed by
20 the SCS 100 via a request rules signal 162 which results in the transfer of a copy of rules 164 to the SCS 100.

25 The SCS 100 forms program demographic vectors 170 from program demographics 172, as illustrated in FIG. 1. The program demographic vectors 170 also represent characteristics of source related information in the form of the intended or expected demographics of the audience for which the source material is intended.

30 Subscriber selection data 110 is obtained from the monitored activities of the user and in a preferred embodiment can be stored in a dedicated memory. In an alternate embodiment, the subscriber selection data 110 is stored in a storage disk. Information which is utilized to form the subscriber selection data 110 includes time 112, which corresponds to the time of an event, channel ID 114, program ID 116, volume level 118, channel change record 119, and program title 117. A detailed record of selection data is illustrated in FIG. 6.

35 In a preferred embodiment, a household viewing habits 195 illustrated in FIG. 1 is computed from the subscriber

5 selection data 110. The SCS 100 transfers household viewing
data 197 to form household viewing habits 195. The
household viewing data 197 is derived from the subscriber
selection data 110 by looking at viewing habits at a
10 5 particular time of day over an extended period of time,
usually several days or weeks, and making some
generalizations regarding the viewing habits during that
time period.

15 The program characteristics vector 150 is derived from
10 the source related text 136 and/or from the EPG 140 by
applying information retrieval techniques. The details of
this process are discussed in accordance with FIG. 8.

20 The program characteristics vector 150 is used in
combination with a set of the heuristic rules 160 to define
15 a set of the program demographic vectors 170 illustrated in
FIG. 1 describing the audience the program is intended for.

25 One output of the SCS 100 is a household profile
including household demographic characteristics 190 and a
household interest profile 180. The household demographic
30 20 characteristics 190 resulting from the transfer of household
demographic data 192, and the household interest profile
180, resulting from the transfer of household interests data
182. Both the household demographics characteristics 190
35 and the household interest profile 180 have a session value
25 and an average value, as will be discussed herein.

40 The monitoring system depicted in FIG. 2 is responsible
for monitoring the subscriber activities, and can be used to
realize the SCS 100. In a preferred embodiment, the
monitoring system of FIG. 2 is located in a television set-
30 top device or in the television itself. In an alternate
45 embodiment, the monitoring system is part of a computer
which receives programming from a network.

50 In an application of the system for television
services, an input connector 220 accepts the video signal

5 coming either from an antenna, cable television input, or
other network. The video signal can be analog or Digital
MPEG. Alternatively, the video source may be a video stream
or other multimedia stream from a communications network
10 including the Internet.

10 In the case of either analog or digital video, selected
fields are defined to carry EPG data or closed captioning
text. For analog video, the closed captioning text is
15 embedded in the vertical blanking interval (VBI). As
described in US Patent 5,579,005, assigned to Scientific-
Atlanta, Inc., the EPG information can be carried in a
dedicated channel or embedded in the VBI. For digital
20 video, the closed captioning text is carried as video user
bits in a user_data field. The EPG data is transmitted as
15 ancillary data and is multiplexed at the transport layer
with the audio and video data.

25 Referring to FIG. 2, a system control unit 200 receives
commands from the user 120, decodes the command and forwards
the command to the destined module. In a preferred
30 embodiment, the commands are entered via a remote control to
a remote receiver 205 or a set of selection buttons 207
available at the front panel of the system control unit 200.
In an alternate embodiment, the commands are entered by the
35 user 120 via a keyboard.

25 The system control unit 200 also contains a Central
Processing Unit (CPU) 203 for processing and supervising all
of the operations of the system control unit 200, a Read
40 Only Memory (ROM) 202 containing the software and fixed
data, a Random Access Memory (RAM) 204 for storing data. CPU
30 203, RAM 204, ROM 202, and I/O controller 201 are attached
to a master bus 206. A power supply in a form of battery
45 can also be included in the system control unit 200 for
backup in case of power outage.

50 An input/output (I/O) controller 201 interfaces the

5 system control unit 200 with external devices. In a preferred embodiment, the I/O controller 201 interfaces to the remote receiver 205 and a selection button such as the channel change button on a remote control. In an alternate
10 5 embodiment, it can accept input from a keyboard or a mouse.

The program selection data 122 is forwarded to a channel processor 210. The channel processor 210 tunes to a selected channel and the media stream is decomposed into its
15 basic components: the video stream, the audio stream, and the data stream. The video stream is directed to a video processor module 230 where it is decoded and further
20 processed for display to the TV screen. The audio stream is directed to an audio processor 240 for decoding and output to the speakers.

15 The data stream can be EPG data, closed captioning text, Extended Data Service (EDS) information, a combination of these, or an alternate type of data. In the case of EDS the call sign, program name and other useful data are provided. In a preferred embodiment, the data stream is
25 stored in a reserved location of the RAM 204. In an alternate embodiment, a magnetic disk is used for data storage. The system control unit 200 writes also in a dedicated memory, which in a preferred embodiment is the RAM 204, the selected channel, the time 112 of selection, the
30 volume level 118 and the program ID 116 and the program title 117. Upon receiving the program selection data 122, the new selected channel is directed to the channel processor 210 and the system control unit 200 writes to the dedicated memory the channel selection end time and the
35 program title 117 at the time 112 of channel change. The system control unit 200 keeps track of the number of channel changes occurring during the viewing time via the channel change record 119. This data forms part of the subscriber
40 selection data 110.

5 The volume control signal 124 is sent to the audio
processor 240. In a preferred embodiment, the volume level
118 selected by the user 120 corresponds to the listening
volume. In an alternate embodiment, the volume level 118
10 5 selected by the user 120 represents a volume level to
another piece of equipment such as an audio system (home
theatre system) or to the television itself. In such a
case, the volume can be measured directly by a microphone or
15 other audio sensing device which can monitor the volume at
10 which the selected source material is being listened.

A program change occurring while watching a selected
channel is also logged by the system control unit 200.
20 Monitoring the content of the program at the time of the
program change can be done by reading the content of the
15 EDS. The EDS contains information such as program title,
which is transmitted via the VBI. A change on the program
25 title field is detected by the monitoring system and logged
as an event. In an alternate embodiment, an EPG is present
and program information can be extracted from the EPG. In a
30 20 preferred embodiment, the programming data received from the
EDS or EPG permits distinguishing between entertainment
programming and advertisements.

FIG. 3 shows the block diagram of the channel processor
35 210. In a preferred embodiment, the input connector 220
25 connects to a tuner 300 which tunes to the selected channel.
A local oscillator can be used to heterodyne the signal to
the IF signal. A demodulator 302 demodulates the received
40 signal and the output is fed to an FEC decoder 304. The data
stream received from the FEC decoder 304 is, in a preferred
30 embodiment, in an MPEG format. In a preferred embodiment,
45 system demultiplexer 306 separates out video and audio
information for subsequent decompression and processing, as
well as ancillary data which can contain program related
information.

5 The data stream presented to the system demultiplexer 306 consists of packets of data including video, audio and ancillary data. The system demultiplexer 306 identifies each packet from the stream ID and directs the stream to the
10 corresponding processor. The video data is directed to the video processor module 230 and the audio data is directed to the audio processor 240. The ancillary data can contain closed captioning text, emergency messages, program guide,
15 or other useful information.

20 Closed captioning text is considered to be ancillary data and is thus contained in the video stream. The system demultiplexer 306 accesses the user data field of the video stream to extract the closed captioning text. The program guide, if present, is carried on data stream identified by a
25 specific transport program identifier.

30 In an alternate embodiment, analog video can be used. For analog programming, ancillary data such as closed captioning text or EDS data are carried in a vertical blanking interval.

35 FIG. 4 shows the block diagram of a computer system for a realization of the subscriber monitoring system based on the reception of multimedia signals from a bi-directional network. A system bus 422 transports data amongst the CPU 203, the RAM 204, Read Only Memory - Basic Input Output
40 System (ROM-BIOS) 406 and other components. The CPU 203 accesses a hard drive 400 through a disk controller 402. The standard input/output devices are connected to the system bus 422 through the I/O controller 201. A keyboard is attached to the I/O controller 201 through a keyboard port
45 416 and the monitor is connected through a monitor port 418. The serial port device uses a serial port 420 to communicate with the I/O controller 201. Industry Standard Architecture (ISA) expansion slots 408 and Peripheral Component
50 Interconnect (PCI) expansion slots 410 allow additional

cards to be placed into the computer. In a preferred embodiment, a network card is available to interface a local area, wide area, or other network.

FIG. 5 illustrates a channel sequence and volume over a twenty-four (24) hour period. The Y-axis represents the status of the receiver in terms of on/off status and volume level. The X-axis represents the time of day. The channels viewed are represented by the windows 501-506, with a first channel 502 being watched followed by the viewing of a second channel 504, and a third channel 506 in the morning. In the evening a fourth channel 501 is watched, a fifth channel 503, and a sixth channel 505. A channel change is illustrated by a momentary transition to the "off" status and a volume change is represented by a change of level on the Y-axis.

A detailed record of the subscriber selection data is illustrated in FIG. 6 in a table format. A time column 602 contains the starting time of every event occurring during the viewing time. A Channel ID column 604 lists the channels viewed or visited during that period. A program title column 603 contains the titles of all programs viewed. A volume column 601 contains the volume level at the time of viewing a selected channel.

A representative statistical record corresponding to the household viewing habits is illustrated in FIG. 7. In a preferred embodiment, a time of day column 700 is organized in period of time including morning, mid-day, afternoon, night, and late night. In an alternate embodiment, smaller time periods are used. A minutes watched column 702 lists, for each period of time, the time in minutes in which the SCS recorded delivery of programming. The number of channel changes during that period and the average volume are also included in that table in a channel changes column 704 and an average volume

5 column 706 respectively. The last row of the statistical
record contains the totals for the items listed in the
minutes watched column 702, the channel changes column 704
and the average volume 706.

10 5 FIG. 8A illustrates an entity-relationship diagram for
the generation of the program characteristics vector 150.
The context vector generation and retrieval technique
described in US Patent 5,619,709, which is incorporated
15 herein by reference, can be applied for the generation of
the program characteristics vectors 150. Other techniques
are well known by those skilled in the art.

20 Referring to FIG. 8A, the source material 130 or the
EPG 140 are passed through a program characterization
process 800 to generate the program characteristics vectors
15 150. The program characterization process 800 is described
in accordance with FIG. 8B. Program content descriptors
25 including a first program content descriptor 802, a second
program content descriptor 804 and an nth program content
descriptor 806, each classified in terms of the category
30 144, the sub-category 146, and other divisions as identified
in the industry accepted program classification system, are
presented to a context vector generator 820. As an example,
35 the program content descriptor can be text representative of
the expected content of material found in the particular
25 program category 144. In this example, the program content
descriptors 802, 804 and 806 would contain text
40 representative of what would be found in programs in the
news, fiction, and advertising categories respectively. The
context vector generator 820 generates context vectors for
30 that set of sample texts resulting in a first summary
context vector 808, a second summary context vector 810, and
45 an nth summary context vector 812. In the example given, the
summary context vectors 808, 810, and 812 correspond to the
categories of news, fiction and advertising respectively.

5 The summary vectors are stored in a local data storage system.

10 Referring to FIG. 8B, a sample of the source related text 136 which is associated with the new program to be classified is passed to the context vector generator 820 which generates a program context vector 840 for that program. The source related text 136 can be either the source material 130, the EPG 140, or other text associated with the source material. A comparison is made between the actual program context vectors and the stored program content context vectors by computing, in a dot product computation process 830, the dot product of the first summary context vector 808 with the program context vector 840 to produce a first dot product 814. Similar operations are performed to produce second dot product 816 and nth dot product 818.

25 The values contained in the dot products 814, 816 and 818, while not probabilistic in nature, can be expressed in probabilistic terms using a simple transformation in which the result represents a confidence level of assigning the corresponding content to that program. The transformed values add up to one. The dot products can be used to classify a program, or form a weighted sum of classifications which results in the program characteristics vectors 150. In the example given, if the source related text 136 was from an advertisement, the nth dot product 818 would have a high value, indicating that the advertising category was the most appropriate category, and assigning a high probability value to that category. If the dot products corresponding to the other categories were significantly higher than zero, those categories would be assigned a value, with the result being the program characteristics vectors 150 as shown in FIG. 9D.

50 For the sub-categories, probabilities obtained from the

5 content pertaining to the same sub-category 146 are summed
to form the probability for the new program being in that
sub-category 146. At the sub-category level, the same method
is applied to compute the probability of a program being
10 from the given category 144. The three levels of the program
classification system; the category 144, the sub-category
146 and the content, are used by the program
characterization process 800 to form the program
15 characteristics vectors 150 which are depicted in FIGS. 9D-
10 9F.

The program characteristics vectors 150 in general are
represented in FIGS. 9A through 9F. FIGS. 9A, 9B and 9C are
20 an example of deterministic program vectors. This set of
vectors is generated when the program characteristics are
15 well defined, as can occur when the source related text 136
or the EPG 140 contains specific fields identifying the
category 144 and the sub-category 146. A program rating can
25 also provided by the EPG 140.

In the case that these characteristics are not
30 specified, a statistical set of vectors is generated from
the process described in accordance with FIG. 8. FIG. 9D
shows the probability that a program being watched is from
the given category 144. The categories are listed in the X-
35 axis. The sub-category 146 is also expressed in terms of
25 probability. This is shown in FIG. 9E. The content component
of this set of vectors is a third possible level of the
program classification, and is illustrated in FIG. 9F.

FIG. 10A illustrates sets of logical heuristics rules
which form part of the heuristic rules 160. In a preferred
30 embodiment, logical heuristic rules are obtained from
sociological or psychological studies. Two types of rules
45 are illustrated in FIG. 10A. The first type links an
individual's viewing characteristics to demographic
characteristics such as gender, age, and income level. A

5 channel changing rate rule 1030 attempts to determine gender
based on channel change rate. An income related channel
change rate rule 1010 attempts to link channel change rates
to income brackets. A second type of rules links particular
10 5 programs to particular audience, as illustrated by a gender
determining rule 1050 which links the program category
144/sub-category 146 with a gender. The result of the
application of the logical heuristic rules illustrated in
15 FIG. 10A are probabilistic determinations of factors
including gender, age, and income level. Although a specific
set of logical heuristic rules has been used as an example,
a wide number of types of logical heuristic rules can be
20 used to realize the present invention. In addition, these
rules can be changed based on learning within the system or
15 based on external studies which provide more accurate rules.

25 FIG. 10B illustrates a set of the heuristic rules 160
expressed in terms of conditional probabilities. In the
example shown in FIG. 10B, the category 144 has associated
with it conditional probabilities for demographic factors
30 20 such as age, income, family size and gender composition.
The category 144 has associated with it conditional
probabilities that represent probability that the viewing
group is within a certain age group dependent on the
35 probability that they are viewing a program in that category
25 144.

40 FIG. 11 illustrates an entity-relationship diagram for
the generation of the program demographic vectors 170. In a
preferred embodiment, the heuristic rules 160 are applied
along with the program characteristic vectors 150 in a
30 45 program target analysis process 1100 to form the program
demographic vectors 170. The program characteristic vectors
150 indicate a particular aspect of a program, such as its
violence level. The heuristic rules 160 indicate that a
50 particular demographic group has a preference for that

5 program. As an example, it may be the case that young males
have a higher preference for violent programs than other
sectors of the population. Thus, a program which has the
program characteristic vectors 150 indicating a high
10 5 probability of having violent content, when combined with
the heuristic rules 160 indicating that "young males like
violent programs," will result, through the program target
analysis process 1100, in the program demographic vectors
15 170 which indicate that there is a high probability that the
10 program is being watched by a young male.

The program target analysis process 1100 can be
realized using software programmed in a variety of languages
20 which processes mathematically the heuristic rules 160 to
derive the program demographic vectors 170. The table
15 representation of the heuristic rules 160 illustrated in
FIG. 10B expresses the probability that the individual or
25 household is from a specific demographic group based on a
program with a particular category 144. This can be
expressed, using probability terms as follow "the
30 20 probability that the individuals are in a given demographic
group conditional to the program being in a given category".
Referring to FIG. 9D, the probability that the group has
certain demographic characteristics based on the program
35 being in a specific category is illustrated.

25 Expressing the probability that a program is destined
to a specific demographic group can be determined by
40 applying Bayes rule. This probability is the sum of the
conditional probabilities that the demographic group likes
the program, conditional to the category 144 weighted by the
30 probability that the program is from that category 144. In a
45 preferred embodiment, the program target analysis can
calculate the program demographic vectors by application of
logical heuristic rules, as illustrated in FIG. 10A, and by
50 application of heuristic rules expressed as conditional

probabilities as shown in FIG. 10B. Logical heuristic rules
can be applied using logical programming and fuzzy logic
using techniques well understood by those skilled in the
art, and are discussed in the text by S. V. Kartalopoulos
entitled "Understanding Neural Networks and Fuzzy Logic"
which is incorporated herein by reference.

Conditional probabilities can be applied by simple
mathematical operations multiplying program context vectors
by matrices of conditional probabilities. By performing
this process over all the demographic groups, the program
target analysis process 1100 can measure how likely a
program is to be of interest to each demographic group.
Those probabilities values form the program demographic
vector 170 represented in FIG.12.

As an example, the heuristic rules expressed as
conditional probabilities shown in FIG. 10B are used as part
of a matrix multiplication in which the program
characteristics vector 150 of dimension N, such as those
shown in FIGS. 9A-9F is multiplied by an $N \times M$ matrix of
heuristic rules expressed as conditional probabilities, such
as that shown in FIG. 10B. The resulting vector of
dimension M is a weighted average of the conditional
probabilities for each category and represents the household
demographic characteristics 190. Similar processing can be
performed at the sub-category and content levels.

FIG. 12 illustrates an example of the program
demographic vector 170, and shows the extent to which a
particular program is destined to a particular audience.
This is measured in terms of probability as depicted in FIG.
12. The Y-axis is the probability of appealing to the
demographic group identified on the X-axis.

FIG. 13 illustrates an entity-relationship diagram for
the generation of household session demographic data 1310
and household session interest profile 1320. In a preferred

embodiment, the subscriber selection data 110 is used along with the program characteristics vectors 150 in a session characterization process 1300 to generate the household session interest profile 1320. The subscriber selection data 110 indicates what the subscriber is watching, for how long and at what volume they are watching the program.

In a preferred embodiment, the session characterization process 1300 forms a weighted average of the program characteristics vectors 150 in which the time duration the program is watched is normalized to the session time (typically defined as the time from which the unit was turned on to the present). The program characteristics vectors 150 are multiplied by the normalized time duration (which is less than one unless only one program has been viewed) and summed with the previous value. Time duration data, along with other subscriber viewing information, is available from the subscriber selection data 110. The resulting weighted average of program characteristics vectors forms the household session interest profile 1320, with each program contributing to the household session interest profile 1320 according to how long it was watched. The household session interest profile 1320 is normalized to produce probabilistic values of the household programming interests during that session.

In an alternate embodiment, the heuristic rules 160 are applied to both the subscriber selection data 110 and the program characteristics vectors 150 to generate the household session demographic data 1310 and the household session interest profile 1320. In this embodiment, weighted averages of the program characteristics vectors 150 are formed based on the subscriber selection data 110, and the heuristic rules 160 are applied. In the case of logical heuristic rules as shown in FIG. 10A, logical programming can be applied to make determinations regarding the

household session demographic data 1310 and the household session interest profile 1320. In the case of heuristic rules in the form of conditional probabilities such as those illustrated in FIG. 10B, a dot product of the time averaged values of the program characteristics vectors can be taken with the appropriate matrix of heuristic rules to generate both the household session demographic data 1310 and the household session interest profile 1320.

Volume control measurements which form part of the subscriber selection data 110 can also be applied in the session characterization process 1300 to form a household session interest profile 1320. This can be accomplished by using normalized volume measurements in a weighted average manner similar to how time duration is used. Thus, muting a show results in a zero value for volume, and the program characteristics vector 150 for this show will not be averaged into the household session interest profile 1320.

FIG. 14 illustrates an entity-relationship diagram for the generation of average household demographic characteristics and session household demographic characteristics 190. A household demographic characterization process 1400 generates the household demographic characteristics 190 represented in table format in FIG. 15. The household demographic characterization process 1400 uses the household viewing habits 195 in combination with the heuristic rules 160 to determine demographic data. For example, a household with a number of minutes watched of zero during the day may indicate a household with two working adults. Both logical heuristic rules as well as rules based on conditional probabilities can be applied to the household viewing habits 195 to obtain the household demographics characteristics 190.

The household viewing habits 195 is also used by the system to detect out-of-habits events. For example, if a

household with a zero value for the minutes watched column 702 at late night presents a session value at that time via the household session demographic data 1310, this session will be characterized as an out-of-habits event and the system can exclude such data from the average if it is highly probable that the demographics for that session are greatly different than the average demographics for the household. Nevertheless, the results of the application of the household demographic characterization process 1400 to the household session demographic data 1310 can result in valuable session demographic data, even if such data is not added to the average demographic characterization of the household.

FIG. 15 illustrates the average and session household demographic characteristics. A household demographic parameters column 1501 is followed by an average value column 1505, a session value column 1503, and an update column 1507. The average value column 1505 and the session value column 1503 are derived from the household demographic characterization process 1400. The deterministic parameters such as address and telephone numbers can be obtained from an outside source or can be loaded into the system by the subscriber or a network operator at the time of installation. Updating of deterministic values is prevented by indicating that these values should not be updated in the update column 1507.

FIG. 16 illustrates an entity-relationship diagram for the generation of the household interest profile 180 in a household interest profile generation process 1600. In a preferred embodiment, the household interest profile generation process comprises averaging the household session interest profile 1320 over multiple sessions and applying the household viewing habits 195 in combination with the heuristic rules 160 to form the household interest profile

180 which takes into account both the viewing preferences of the household as well as assumptions about households/subscribers with those viewing habits and program preferences.

FIG. 17 illustrates the household interest profile 180 which is composed of a programming types row 1709, a products types row 1707, and a household interests column 1701, an average value column 1703, and a session value column 1705.

The product types row 1707 gives an indication as to what type of advertisement the household would be interested in watching, thus indicating what types of products could potentially be advertised with a high probability of the advertisement being watched in its entirety. The programming types row 1709 suggests what kind of programming the household is likely to be interested in watching. The household interests column 1701 specifies the types of programming and products which are statistically characterized for that household.

As an example of the industrial applicability of the invention, a household will perform its normal viewing routine without being requested to answer specific questions regarding likes and dislikes. Children may watch television in the morning in the household, and may change channels during commercials, or not at all. The television may remain off during the working day, while the children are at school and day care, and be turned on again in the evening, at which time the parents may "surf" channels, mute the television during commercials, and ultimately watch one or two hours of broadcast programming. The present invention provides the ability to characterize the household, and may make the determination that there are children and adults in the household, with program and product interests indicated in the household interest profile 180 corresponding to a

5 family of that composition. A household with two retired
adults will have a completely different characterization
which will be indicated in the household interest profile
180.

10 5 Although the present invention has been largely
described in the context of a single computing platform
receiving programming, the SCS 100 can be realized as part
of a client-server architecture, as illustrated in FIG. 18.
15 Referring to FIG. 18, residence 1800 contains a personal
10 computer (PC) 1820 as well as the combination of a
television 1810 and a set-top 1808, which can request and
receive programming. The equipment in residence 1800, or
20 similar equipment in a small or large business environment,
forms the client side of the network as defined herein.
15 Programming is delivered over an access network 1830, which
may be a cable television network, telephone type network,
25 or other access network. Information requests are made by
the client side to a server 1840 which forms the server side
of the network. Server 1840 has content locally which it
30 20 provides to the subscriber, or requests content on behalf of
the subscriber from a third party content provider 1860, as
illustrated in FIG. 18. Requests made on behalf of the
client side by server 1840 are made across a wide area
35 network 1850 which can be the Internet or other public or
25 private network. Techniques for making requests on behalf of
a client are frequently referred to as proxy techniques and
are well known to those skilled in the art. The server side
40 receives the requested programming which is displayed on PC
1820 or television 1810 according to which device made the
30 request.

45 In a preferred embodiment the server 1840 maintains the
subscriber selection data 110 which it is able to compile
based on its operation as a proxy for the client side.
50 Retrieval of source related information and the program

5 target analysis process 1100, the program characterization
process 800, the program target analysis process 1100, the
session characterization process 1300, the household
demographic characterization process 1400, and the household
10 5 interest profile generation process 1600 can be performed by
server 1840.

Referring to FIG. 19 an advertisement monitoring table
is illustrated, in which an advertisement ID (AD ID) column
15 1915 contains a numerical ID for an advertisement which was
transmitted with the advertisement in the form of a Program
ID, http address, or other identifier which is uniquely
associated with the advertisement. A product column 1921
20 contains a product description which indicates the type of
product that was advertised. A brand column 1927 indicates
15 the brand name of the product or can alternatively list a
generic name for that product. A percent watched column 1933
25 indicates the percentage of the advertisement the subscriber
viewed. In an alternate embodiment, a letter rating or
other type of rating is used to indicate the probability
30 20 that the advertisement was watched. A volume column 1937
indicates the volume level at which the advertisement was
watched.

As an example of the industrial applicability of the
35 invention, a manufacturer may develop an advertising
25 strategy which includes the insertion of advertisements
during popular evening programs. The costs for such ad
insertions can be extremely high. In order to insure the
40 cost effectiveness of this advertising strategy, the
manufacturer has the advertisements placed during less
30 watched but similar programs and monitors how subscribers
45 react, and can determine approximately how many times the
advertisement has been watched out of all of the possible
viewings. This data can be used to confirm the potential
50 effectiveness of the advertisement and to subsequently

5 determine if purchasing the more expensive time during
evening programming will be cost-effective, or if the
advertisement should be modified or placed in other
programming.

10 5 Continuing this example, the manufacturer may place an
advertisement for viewing during "prime time" for an initial
period but can subsequently cancel broadcasts of the
advertisement if it is found that the majority of
15 subscribers never see the advertisement.

10 Although this invention has been illustrated by
reference to specific embodiments, it will be apparent to
those skilled in the art that various changes and
20 modifications may be made which clearly fall within the
scope of the invention. The invention is intended to be
15 protected broadly within the spirit and scope of the
appended claims.
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Claims

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Claims

5 What is claimed is:

1. A data processing system for monitoring advertisements
watched by a subscriber, said data processing system
10 comprising:

- (a) computer processor means for processing data;
- (b) storage means for storing data on a storage
medium;
- 15 (c) first means for monitoring subscriber
activity wherein said first means includes
recording means for storing subscriber
selections;
- 20 (d) second means for retrieving advertisement
related information wherein said advertisement
related information contains descriptive fields
corresponding to said advertisement;
- 25 (e) third means for processing information
wherein said third means includes means for
determining the extent to which an advertisement
is viewed by said subscriber; and
- 30 (f) fourth means for storing said descriptive
fields and said determination of the extent to
which said advertisement is viewed by said
35 subscriber.

2. The system described in claim 1 wherein said first means
40 for monitoring subscriber activity further comprises means
for monitoring volume levels wherein said volume levels
correspond to subscriber selection volume levels.

3. The system described in claim 1 further comprising:
45 (g) fifth means for determining a subscriber
product interests profile; and

5 (h) sixth means for storing said subscriber
products interests profile.

10 4. The system described in claim 1 wherein said second
means for retrieving advertisement related information
further comprises a means for context mining of textual
information associated with said selected source material.

15 5. The system described in claim 4 wherein said textual
information is text derived from closed-captioning data
associated with said advertisement.

20 6. The system described in claim 5 wherein said text
derived from closed-captioning data associated with said
advertisement includes a product name field.

25 7. The system described in claim 4 wherein said text
derived from closed-captioning data associated with said
advertisement includes a product brand field.

30 8. A client-server based data processing system for
monitoring advertisements watched by a subscriber, said
client-server based data processing system comprising:

35 (a) first computer processor means at a client
side for receiving and displaying advertisements
wherein said first computer means is capable of
40 transmitting channel change requests;

(b) second computer processor means at a server
side for receiving said channel change requests
and for processing data;

45 (c) second storage means associated with second
computer processor means for storing data on a
storage medium;

5 (d) first means at said server side for
monitoring subscriber activity wherein said
first means for monitoring subscriber activity
includes receiving means for receiving
10 subscriber channel change requests, recording
means for storing subscriber channel change
requests;

15 (e) second means at said server side for
retrieving advertisement related information
wherein said advertisement related information
contains descriptive fields corresponding to an
advertisement;

20 (f) third means at said server side for
processing information wherein said third means
includes means for determining the extent to
which an advertisement is viewed by said
25 subscriber; and

(g) fourth means at said server side for storing
said descriptive fields and said determination
30 of the extent to which said advertisement is
viewed by said subscriber.

35 9. The system described in claim 8 further comprising:

(h) fifth means for determining a subscriber
product interests profile; and

40 (i) sixth means for storing said subscriber
product interests profile.

45 10. The system described in claim 8 wherein said second
means for retrieving advertisement related information
further comprises a means for context mining of textual
information associated with said selected source material.

5 11. The system described in claim 10 wherein said textual information is text derived from closed-captioning data associated with said advertisement.

10 12. The system described in claim 11 wherein said text derived from closed-captioning data associated with said advertisement includes a product name field.

15 13. The system described in claim 11 wherein said text derived from closed-captioning data associated with said advertisement includes a product brand field.

20 14. A data processing system for generating a subscriber profile vector, said data processing system comprising:

(a) computer processor means for processing data;

25 (b) storage means for storing data on a storage medium;

30 (c) first means for monitoring subscriber activity wherein said first means includes recording means for storing subscriber selection data wherein said subscriber selection data corresponds to selected source material;

35 (d) second means for retrieving source related information wherein said source related information contains descriptive fields corresponding to said selected source material;

40 (e) third means for processing information wherein said third means includes means for processing said subscriber selection data with respect to said descriptive fields to form said subscriber profile vector; and

45 (f) fourth means for storing said subscriber profile vector.

5 15. The system described in claim 14 wherein said first
means for monitoring subscriber activity further comprises
means for monitoring time durations wherein said time
durations correspond to viewing times of said selected
10 source material.

15 16. The system described in claim 14 wherein said first
means for monitoring subscriber activity further comprises
means for monitoring volume levels wherein said volume
levels correspond to subscriber selection volume levels.

20 17. The system described in claim 14 wherein said
subscriber profile vector contains household demographic
data indicating probabilistic measurements of household
demographics.

25 18. The system described in claim 14 wherein said
subscriber profile vector contains household program
preference information indicating probabilistic measurements
30 of household program interests.

35 19. The system described in claim 14 wherein said
subscriber profile vector contains household product
preference information indicating probabilistic measurements
of household product interests.

40 20. The system described in claim 14 wherein said second
means for retrieving source related information further
comprises a means for context mining of textual information
associated with said selected source material.

45 21. The system described in claim 20 wherein said textual
information is text derived from closed-captioning data
associated with said selected source material.
50

5 22. The system described in claim 14 wherein said second
means for retrieving source related information further
comprises a means for retrieving information associated with
10 said selected source material from an electronic program
guide.

15 23. The system described in claim 14 wherein said third
means for processing information processes information over
a viewing session and wherein said subscriber profile vector
corresponds to said viewing session.

20 24. The system described in claim 14 wherein said third
means for processing information processes information over
multiple viewing sessions and wherein said subscriber
25 profile vector corresponds to an average value over said
multiple viewing sessions.

30 25. A data processing system for generating a subscriber
profile vector, said data processing system comprising:

- (a) computer processor means for processing data;
- (b) storage means for storing data on a storage
medium;
- 35 (c) first means for monitoring subscriber
activity wherein said first means includes
recording means for storing subscriber selection
40 data wherein said subscriber selection data
corresponds to selected source material;
- (d) second means for retrieving source related
information wherein said source related
45 information contains descriptive fields
corresponding to said selected source material;

5 (e) third means for generating a program characteristics vector based on said source related information;

10 (f) fourth means for storing a set of heuristic rules;

15 (g) fifth means for processing information wherein said fifth means includes means for processing said subscriber selection data with respect to said program characteristics vector and said set of heuristic rules to form said subscriber profile vector; and

20 (h) sixth means for storing said subscriber profile vector.

25 26. The system described in claim 25 wherein said first means for monitoring subscriber activity further comprises means for monitoring time durations wherein said time durations correspond to viewing times of said selected source material.

30 27. The system described in claim 25 wherein said first means for monitoring subscriber activity further comprises means for monitoring volume levels wherein said volume levels correspond to subscriber selection volume levels.

40 28. The system described in claim 25 wherein said subscriber profile vector contains household demographic data indicating probabilistic measurements of household demographics.

45 29. The system described in claim 25 wherein said subscriber profile vector contains a household session interest profile indicating probabilistic measurements of household interests.

5 30. A data processing system for generating a household demographic characteristics vector, said data processing system comprising:

- 10 (a) computer processor means for processing data;
- (b) storage means for storing data on a storage medium;
- 15 (c) first means for monitoring subscriber activity wherein said first means includes recording means for storing subscriber selection data wherein said subscriber selection data corresponds to selected source material;
- 20 (d) second means for generating household viewing habits information wherein said household viewing habits information is generated from said subscriber selection data;
- 25 (e) third means for storing a set of heuristic rules;
- 30 (f) fourth means for processing information wherein said fourth means includes means for processing said subscriber selection data with respect to said set of heuristic rules to form said household demographic characteristics vector; and
- 35 (g) fifth means for storing said household demographic characteristics vector.

40 31. The system described in claim 30 wherein said fourth means for processing information processes information over a viewing session and wherein said household demographic characteristics vector corresponds to said viewing session.

45 32. The system described in claim 30 wherein said fourth means for processing information processes information over

5 a period of multiple viewing sessions wherein said household demographic characteristics vector corresponds to an average value over said multiple viewing sessions.

10 33. A data processing system for generating a subscriber profile vector in a client-server based architecture, said data processing system comprising:

15 (a) first computer processor means at a client side for requesting and displaying source information wherein said first computer means transmits a request for source material and receives and displays said source material;

20 (b) second computer processor means at a server side for processing data;

25 (c) second storage means associated with second computer processor means for storing data on a storage medium;

30 (d) first means at said server side for monitoring subscriber activity wherein said first means for monitoring subscriber activity includes receiving means for receiving subscriber requests for said source material, recording means for storing subscriber selection data wherein said subscriber selection data corresponds to a record of requests for said source material;

35 (e) second means at said server side for retrieving source related information wherein said source related information contains descriptive fields corresponding to said source material;

40 (f) third means at said server side for processing information wherein said third means includes means for processing said subscriber

5 selection data with respect to said descriptive
 fields to form said subscriber profile vector;
 and

10 (g) fourth means at said server side for storing
 said subscriber profile vector.

15 34. The system described in claim 33 wherein said first
 means for monitoring subscriber activity further comprises
 means for monitoring time durations wherein said time
 durations correspond to viewing times of said selected
 source material.

20 35. The system described in claim 33 wherein said first
 means for monitoring subscriber activity further comprises
 means for monitoring volume levels wherein said volume
25 levels correspond to subscriber selection volume levels.

30 36. The system described in claim 33 wherein said
 subscriber profile vector contains household demographic
 data indicating probabilistic measurements of household
 demographics.

35 37. The system described in claim 33 wherein said
 subscriber profile vector contains household program
 preference information indicating probabilistic measurements
 of household program interests.

40 38. The system described in claim 33 wherein said
 subscriber profile vector contains household product
 preference information indicating probabilistic measurements
45 of household product interests.

50 39. The system described in claim 33 wherein said second
 means for retrieving source related information further

comprises a means for context mining of textual information associated with said selected source material.

40. The system described in claim 39 wherein said textual information is text derived from closed-captioning data associated with said selected source material.

41. The system described in claim 33 wherein said second means for retrieving source related information further comprises a means for retrieving information associated with said selected source material from an electronic program guide.

42. The system described in claim 33 wherein said third means for processing information processes information over a viewing session and wherein said subscriber profile vector corresponds to said viewing session.

43. The system described in claim 33 wherein said third means for processing information processes information over multiple viewing sessions and wherein said subscriber profile vector corresponds to an average value over said multiple viewing sessions.

44. A data processing system for generating a subscriber profile vector in a client-server based architecture, said data processing system comprising:

- (a) first computer processor means at a client side for requesting and displaying source information wherein said first computer means transmits a request for source material and receives and displays said source material;
- (b) second computer processor means at a server side for processing data;

5 (c) second storage means associated with second
computer processor means for storing data on a
storage medium;

10 (d) first means at said server side for
monitoring subscriber activity wherein said
first means for monitoring subscriber activity
includes receiving means for receiving
15 subscriber requests for said source material,
recording means for storing subscriber selection
data wherein said subscriber selection data
corresponds to a record of requests for said
source material;

20 (e) second means at said server side for
retrieving source related information wherein
said source related information contains
25 descriptive fields corresponding to said source
material;

30 (f) third means at said server side for
generating a program characteristics vector
based on said source related information;

(g) fourth means at said server side for storing
a set of heuristic rules;

35 (h) fifth means at said server side for
processing information wherein said fifth means
includes means for processing said subscriber
selection data with respect to said program
40 characteristics vector and said set of heuristic
rules to form said subscriber profile vector;
and

45 (i) sixth means at said server side for storing
said subscriber profile vector.

45. The system described in claim 44 wherein said first
50 means for monitoring subscriber activity further comprises

5 means for monitoring time durations wherein said time durations correspond to viewing times of said selected source material.

10 46. The system described in claim 44 wherein said first means for monitoring subscriber activity further comprises means for monitoring volume levels wherein said volume levels correspond to subscriber selection volume levels.

15 47. The system described in claim 44 wherein said subscriber profile vector contains household demographic data indicating probabilistic measurements of household demographics.

20 48. The system described in claim 44 wherein said subscriber profile vector contains a household session interest profile indicating probabilistic measurements of household interests.

25 49. A data processing system for generating a household demographic characteristics vector in a client-server based architecture, said data processing system comprising:

30 (a) first computer processor means at a client side for requesting and displaying source information wherein said first computer means transmits a request for source material and receives and displays said source material;

35 (b) second computer processor means at a server side for processing data;

40 (c) first means at said server side for monitoring subscriber activity wherein said first means includes recording means for storing subscriber selection data wherein said

subscriber selection data corresponds to
selected source material;

(d) second means at said client side for
generating household viewing habits information
wherein said household viewing habits
information is generated from said subscriber
selection data;

(e) third means at said server side for storing a
set of heuristic rules;

(f) fourth means at said server side for
processing information wherein said fourth means
includes means for processing said subscriber
selection data with respect to said set of
heuristic rules to form said household
demographic characteristics vector; and

(g) fifth means at said server side for storing
said household demographic characteristics
vector.

50. The system described in claim 49 wherein said fourth
means for processing information processes information over
a viewing session and wherein said household demographic
characteristics vector corresponds to said viewing session.

51. The system described in claim 49 wherein said fourth
means for processing information processes information over
a period of multiple viewing sessions wherein said household
demographic characteristics vector corresponds to an average
value over said multiple viewing sessions.

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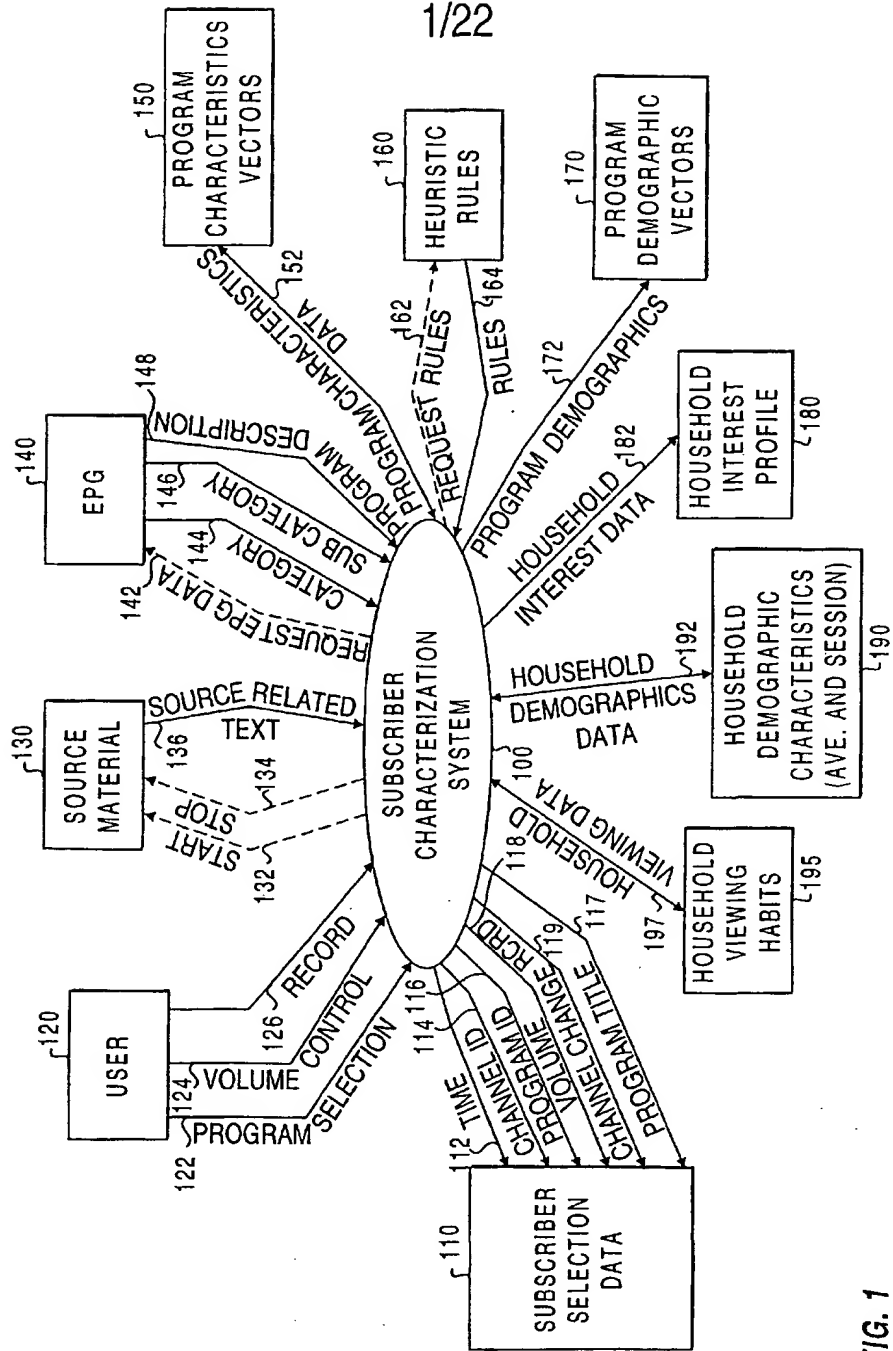


FIG. 1

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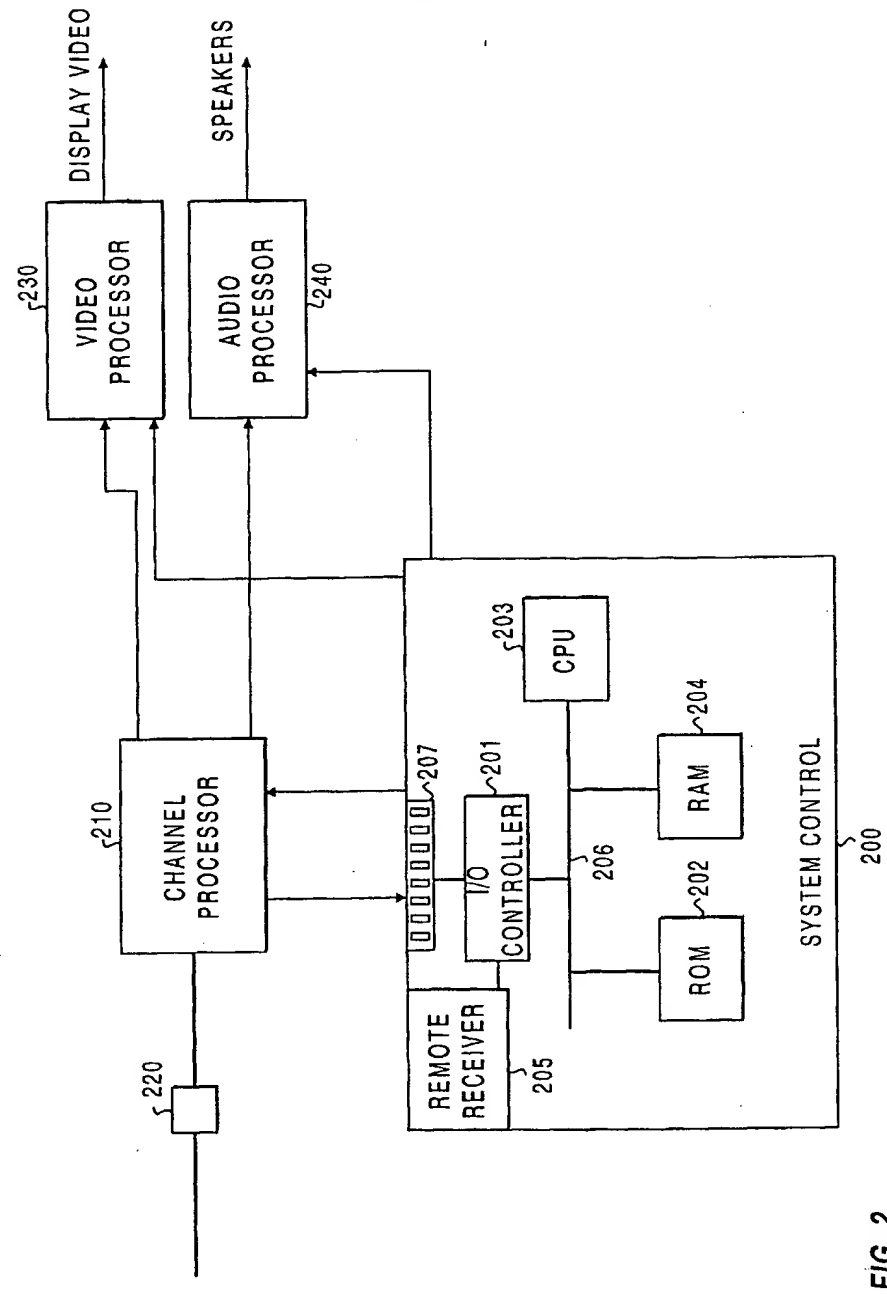


FIG. 2

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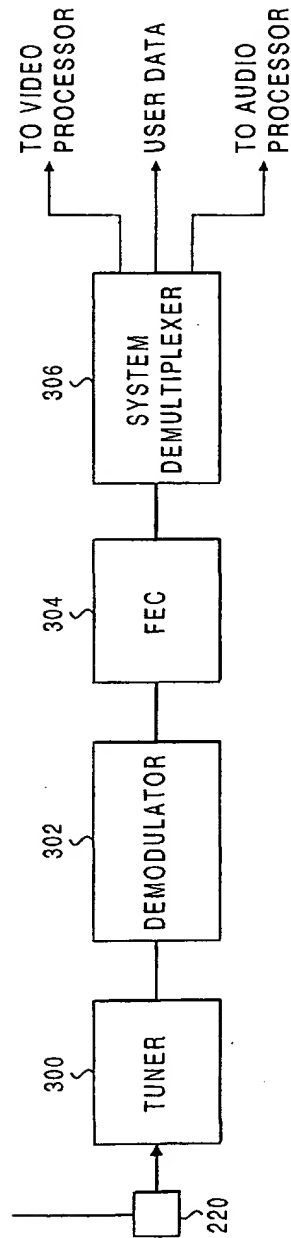


FIG. 3

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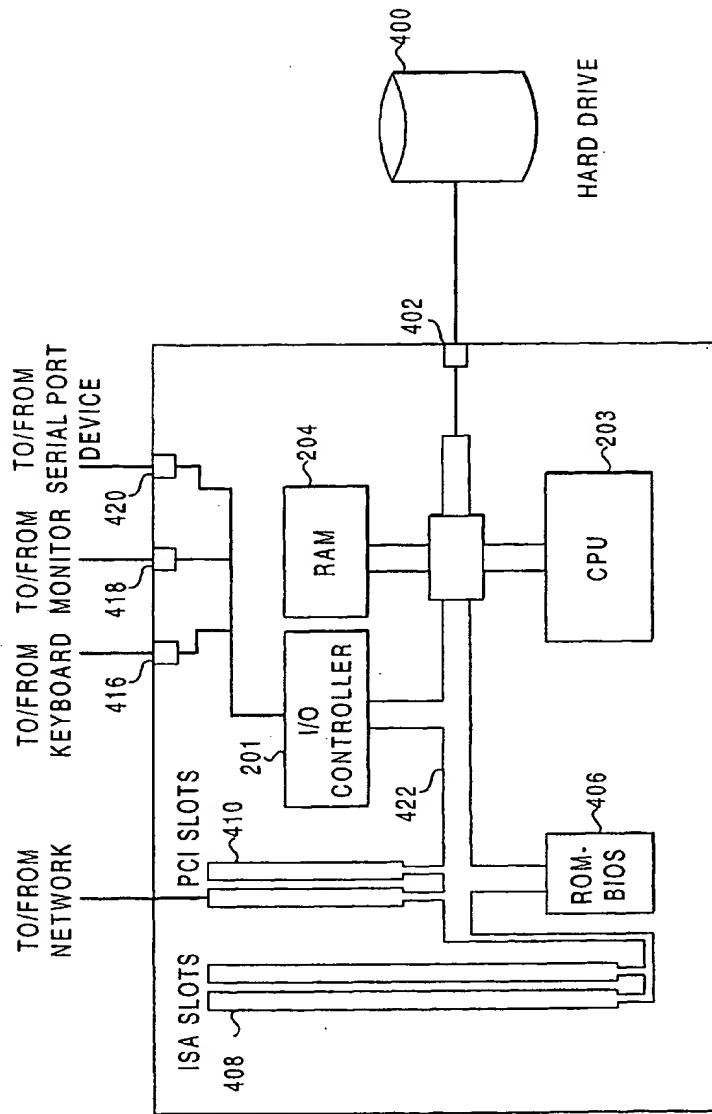


FIG. 4

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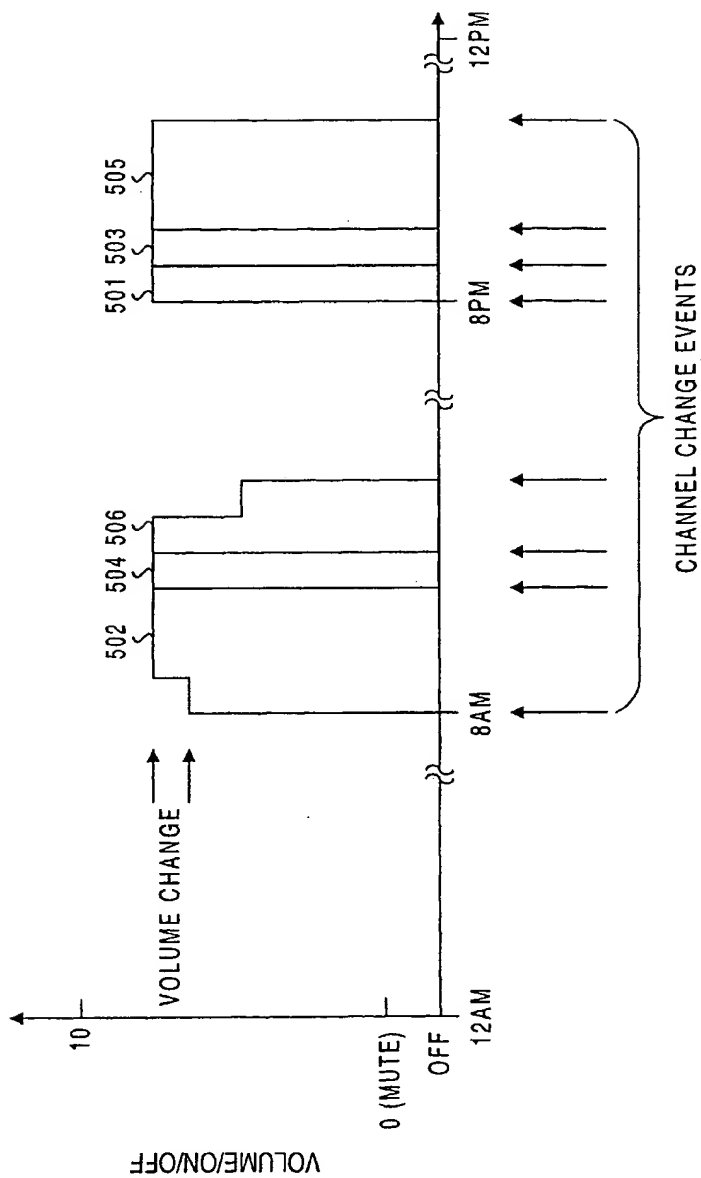


FIG. 5

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602	604	603	601
TIME	CHANNEL ID	PROGRAM TITLE	VOLUME
08:01:25AM	06	"MORNING TV"	5/10
08:01:45AM	13	"GOOD MORNING AMERICA"	5/10
08:03:25AM	13	"GOOD MORNING AMERICA"	6/10
⋮			
06:11:25PM	09	"SEINFELD"	5/10
06:15:23PM	09	"ADVERTISING"	5/10
06:17:25PM	09	"SEINFELD"	5/10
06:28:10PM	09	"ADVERTISING"	5/10
06:30:07PM	52	"LIVING SINGLE"	5/10
⋮			

FIG. 6

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TIME OF DAY	MINUTES WATCHED	CHANNEL CHANGES	AVERAGE VOLUME
MORNING (6AM-9AM)	61	2	5/10
MID-DAY (9AM-3PM)	0	0	.
AFTERNOON (3PM-6PM)	0	0	.
NIGHT (6PM-10PM)	122	4	6/10
LATE NIGHT (12AM-6AM)	0	0	.
TOTAL	183	6	5.7/10

FIG. 7

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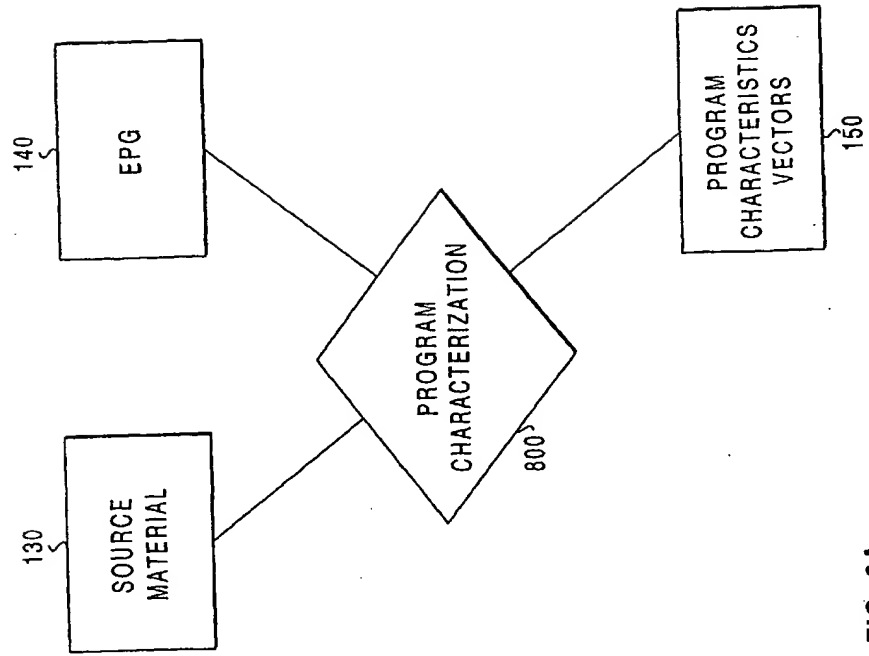


FIG. 8A

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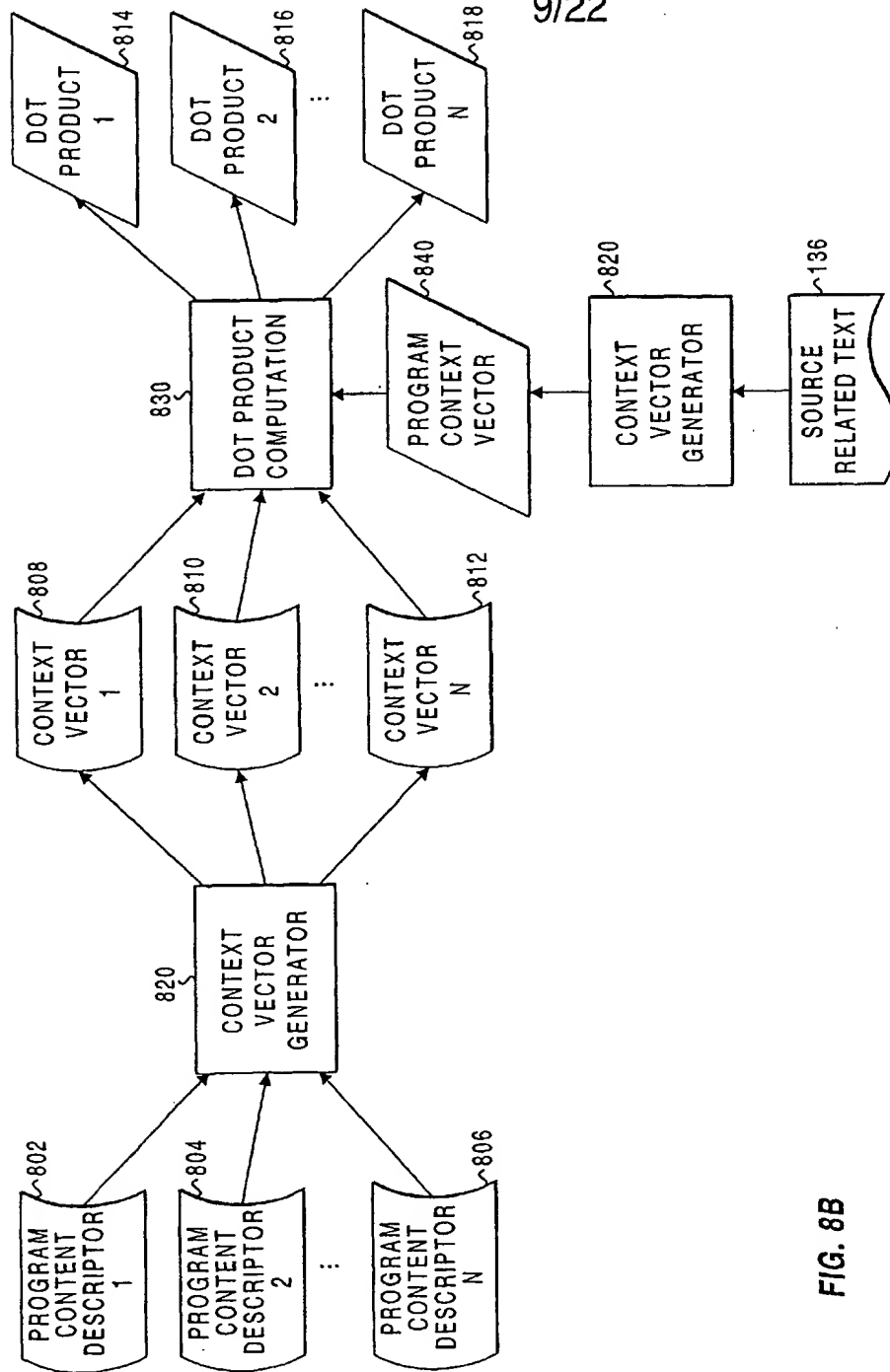


FIG. 8B

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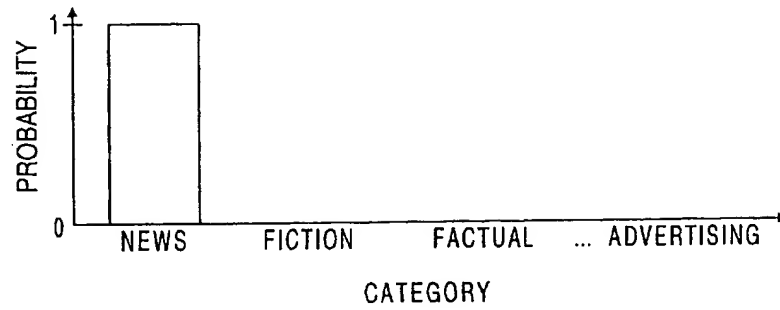


FIG. 9A

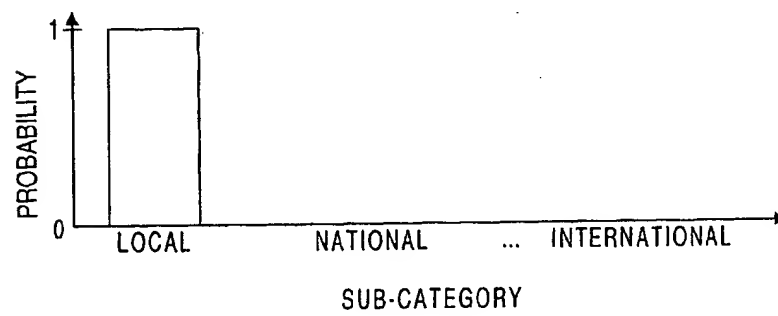


FIG. 9B

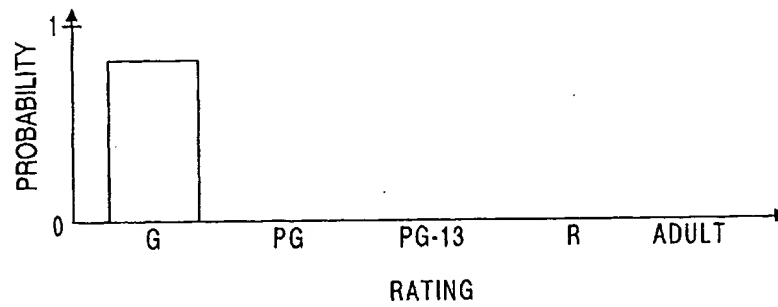


FIG. 9C

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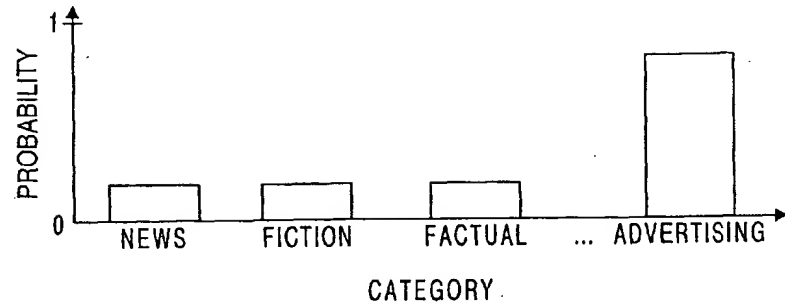


FIG. 9D

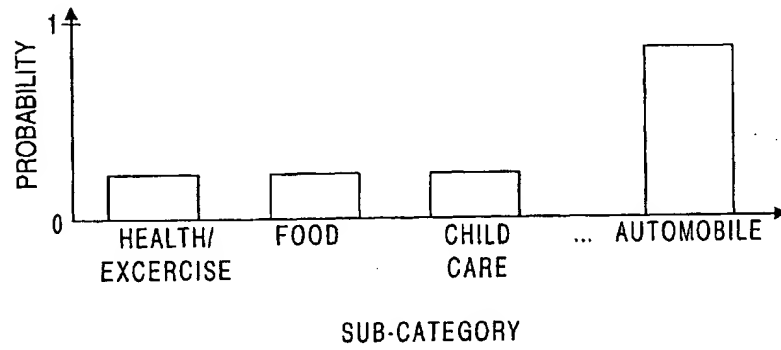


FIG. 9E

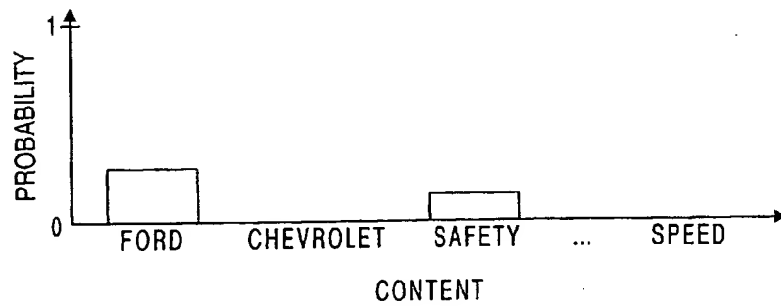


FIG. 9F

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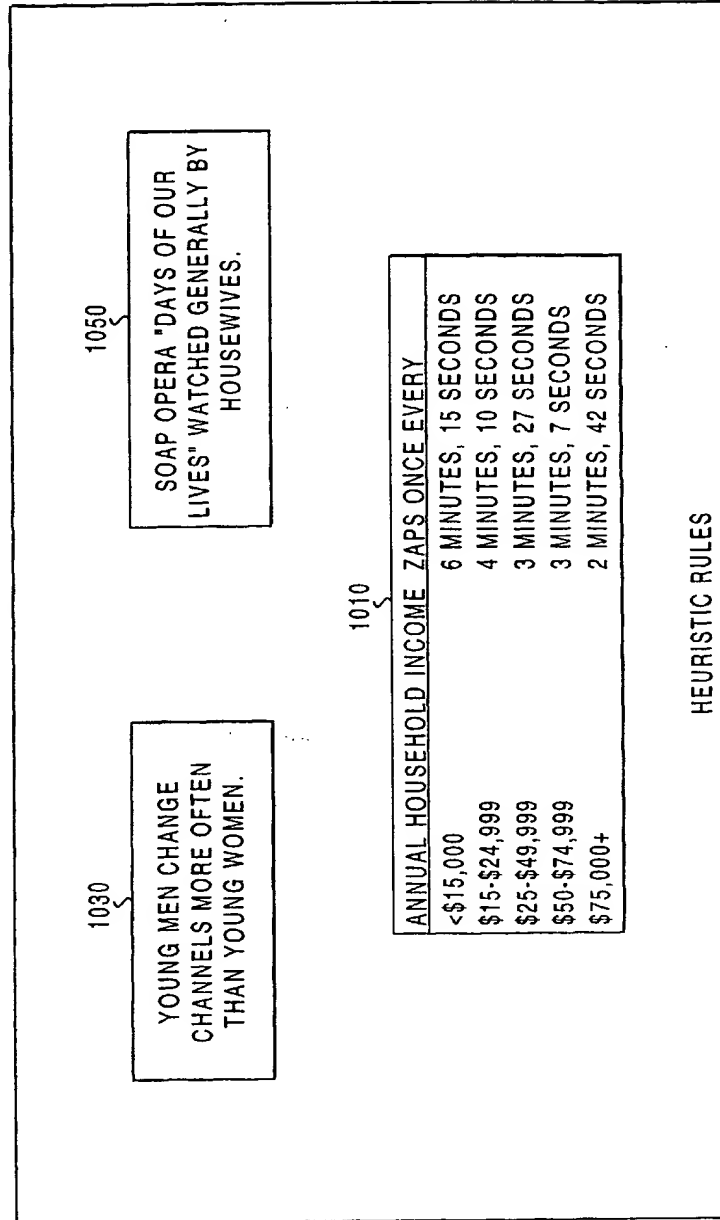


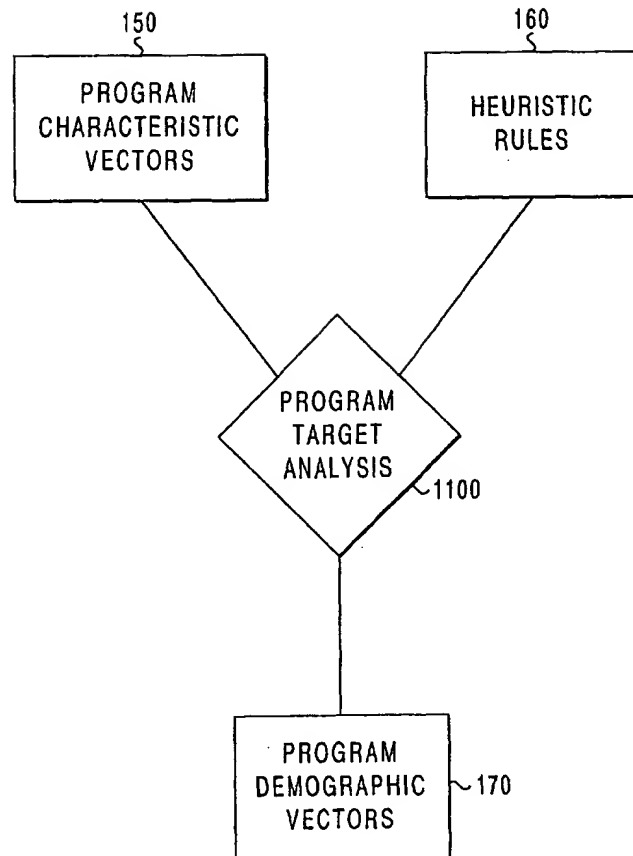
FIG. 10A

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DEMOGRAPHIC GROUPS												
		AGE		INCOME			SIZE		GENDER			
		0-10	10-18 ...	>70	0-20K	20-50K ...	50-100K	1	2 ...	>5	M	F
CATEGORIES	NEWS	0.1	0.1	0.4	0.2	0.3	0.4	0.5	0.3	0.1	0.3	0.7
	FICTION	0.5	0.3	0.2	0.4	0.2	0.3	0.3	0.2	0.1	0.8	0.2
	FACTUAL	0.2	0.2	0.3	0.1	0.4	0.2	0.2	0.2	0.4	0.4	0.6
	:											
	ADVERTISING	0.1	0.3	0.5	0.3	0.2	0.1	0.2	0.1	0.3	0.5	0.5

FIG. 10B

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**FIG. 11**

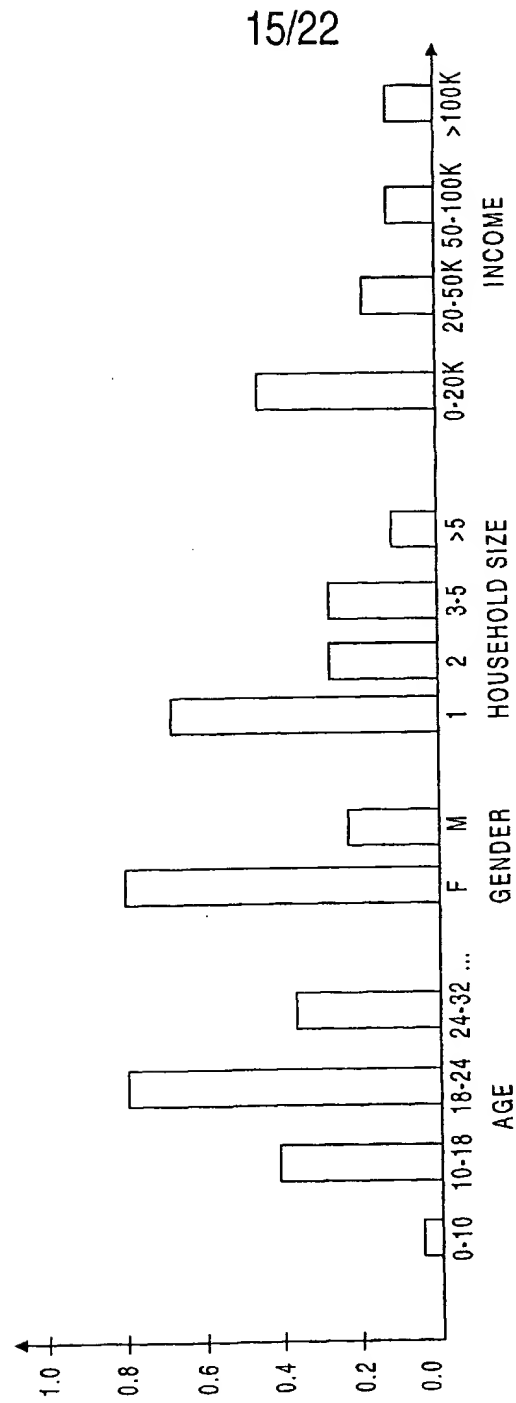


FIG. 12

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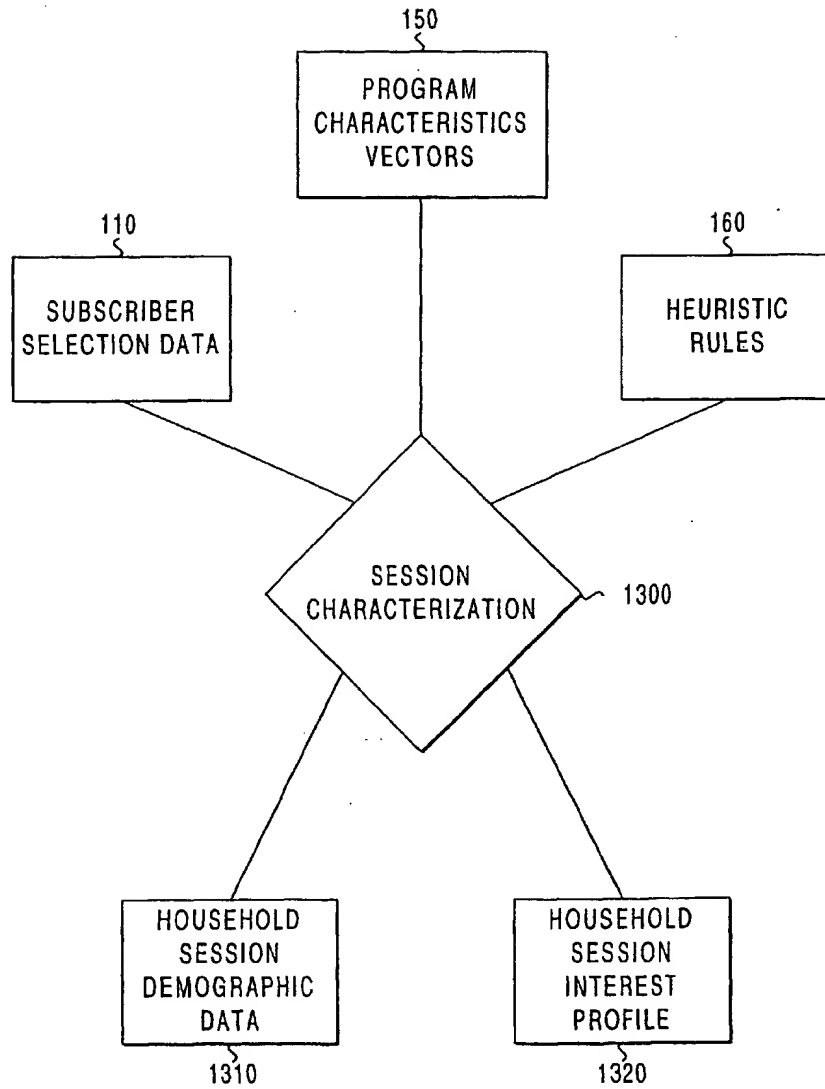


FIG. 13

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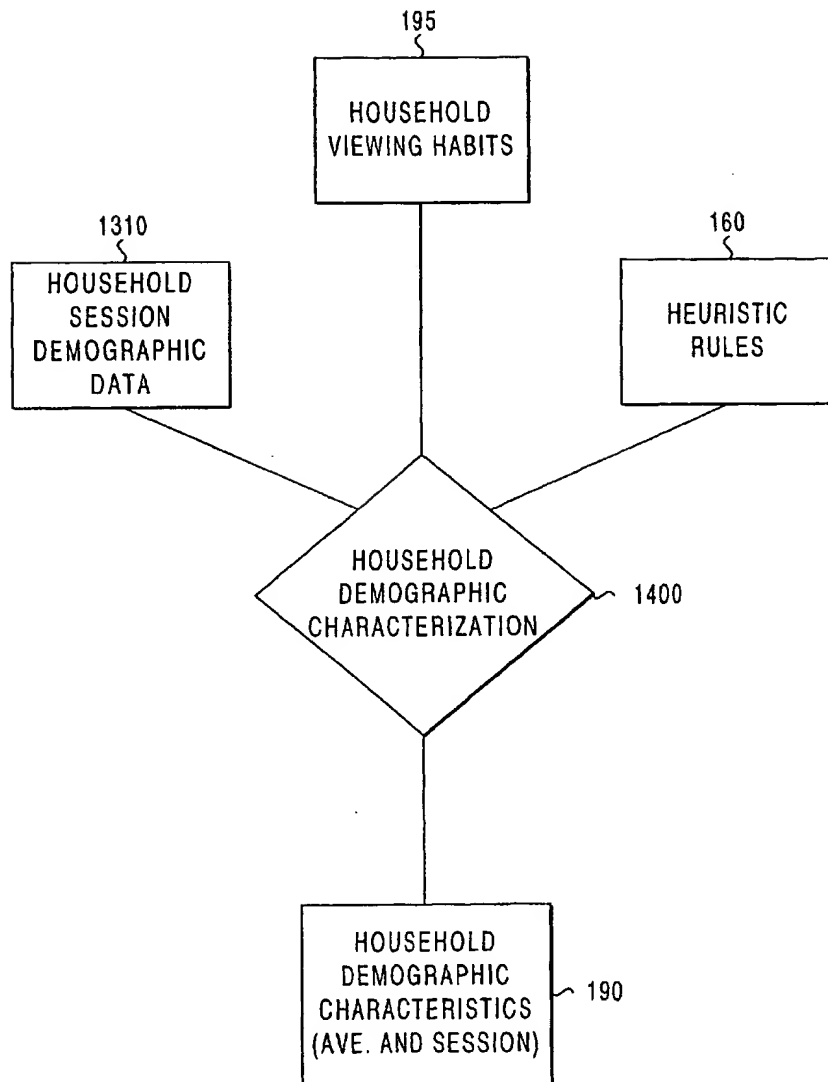


FIG. 14

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1501 S	1505 S	1503 S	1507 S
HOUSEHOLD PARAMETER	AVERAGE VALUE	SESSION VALUE	UPDATE?
SIZE	2.6	3.0	YES
AGE	23.5	12	YES
SEX (FEMALE=1)	0.6	0.7	YES
INCOME (\$0-\$20K)	0.1	0.1	YES
INCOME (\$20-\$50K)	0.6	0.7	YES
INCOME (\$50-\$100K)	0.2	0.1	YES
INCOME (>\$100K)	0.1	0.1	YES
ZIP CODE			NO
TELEPHONE NUMBER			NO

FIG. 15

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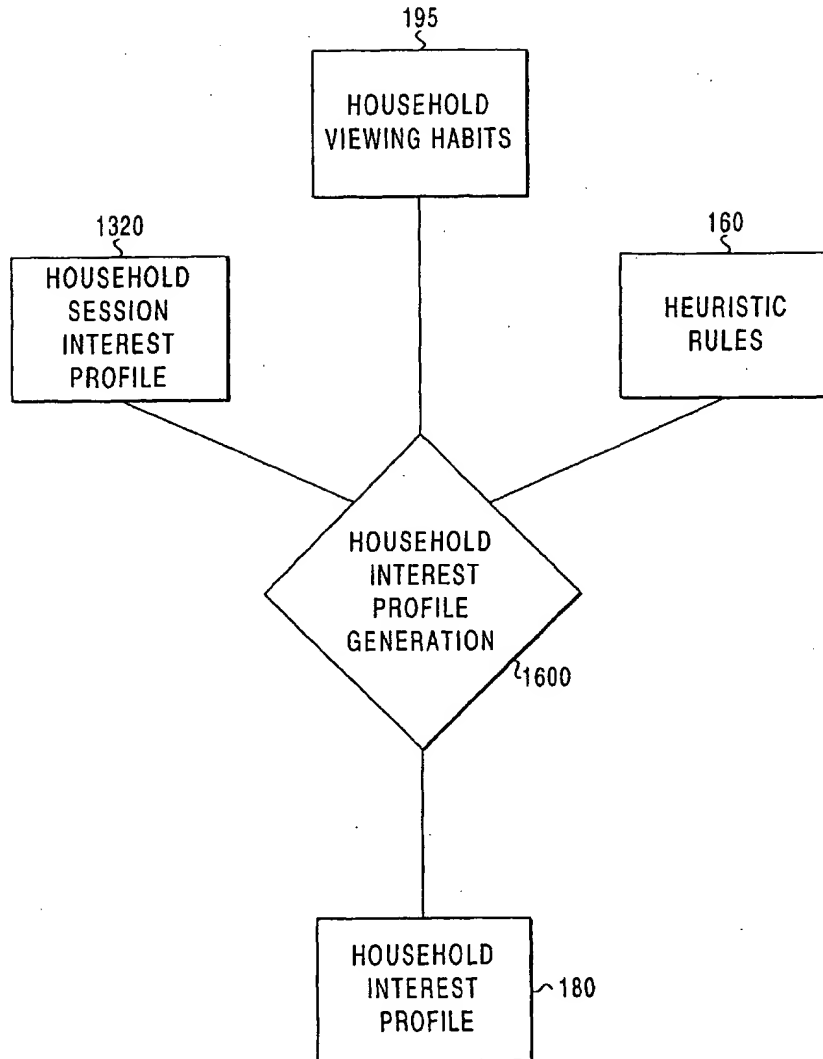


FIG. 16

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		1701	1703	1705
		HOUSEHOLD INTEREST	AVERAGE VALUE	SESSION VALUE
1709	PROGRAMMING	DRAMA	0.1	0.20
		ROMANCE	0.1	0.20
		ACTION	0.6	0.25
		SITCOM	0.2	0.30
		⋮		
		SPORTS	0	0.05
1707	PRODUCTS	HEALTH/EXERCISE	0.6	0.2
		FOOD	0.3	0.4
		CHILD RELATED	0.0	0.1
		TOYS	0.0	0.1
		⋮		
		AUTOMOBILE	0.1	0.2

FIG. 17

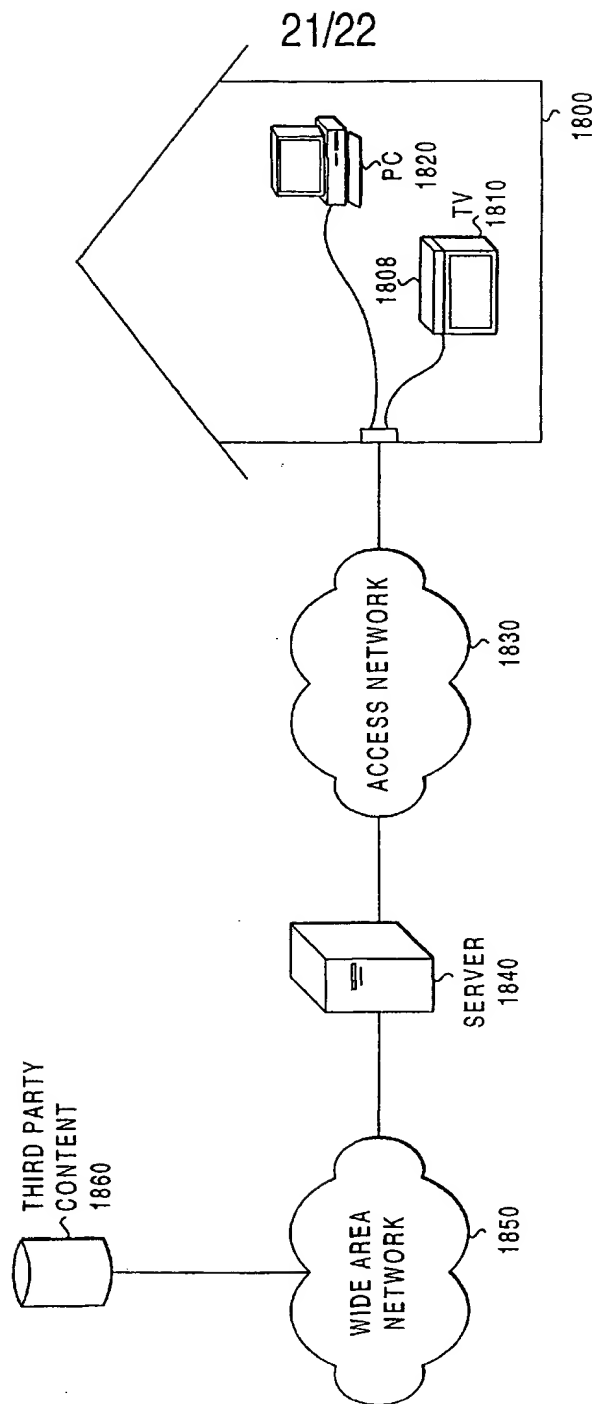


FIG. 18

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1915 S	1921 S	1927 S	1933 S	1937 S
ADID	PRODUCT	BRAND	% WATCHED	VOLUME
216	DIAPERS	HUGS	50%	6/10
1230	DETERGENT	SOAPY	90%	6/10
	:			
4137	AUTOMOBILES	SPEEDSTER	70%	8/10

FIG. 19

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(19) World Intellectual Property Organization
International Bureau



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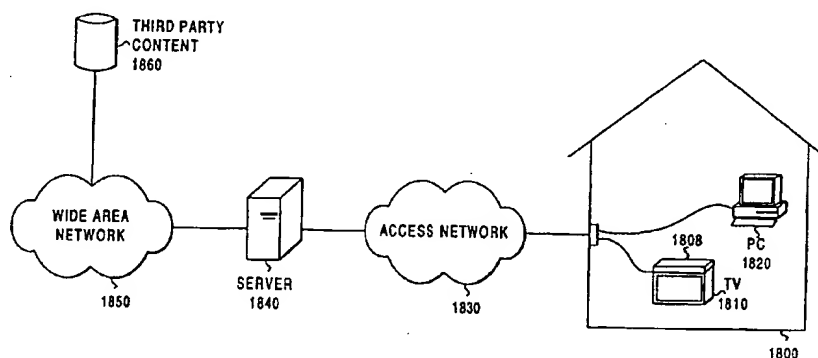
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- (72) Inventors; and
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- (74) Agent: **RYDER, Douglas, J.**; 300 North Broad Street, Doylestown, PA 18901 (US).
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- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- Published:
— With international search report.
- (88) Date of publication of the international search report:
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: SUBSCRIBER CHARACTERIZATION AND ADVERTISEMENT MONITORING SYSTEM



(57) Abstract: A subscriber characterization and advertisement monitoring system is presented in which subscriber viewing habits are monitored to determine demographic profiles. These profiles can be utilized for the matching of advertisements to subscribers based on their viewing habits and estimated demographics and product interests. The system can be run locally in a television set-top (1808) or can be run in client server mode where channel selections are transmitted from the residence (1800) to a centralized switching location server (1840) such as a telephone office or Internet Service Provider. In client-server mode the channel selections are monitored at the centralized location (1840) which also performs the subscriber characterization. The system also provides the ability to monitor if advertisements were viewed and for what duration.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/28528

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H04N 7/173

US CL : 345/327; 348/1,7,9,12,13; 455/2,4,2, 5,1,6,2,6,3

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 345/327; 348/1,7,9,12,13; 455/2,4,2, 5,1,6,2,6,3

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, 5,374,951 A (WELSH) 20 December 1994 figure 7 & columns 14-15.	1
A, P	US 5,977,964 A (WILLIAMS et al.) 02 November 1999 whole document	1-7
A	US 5,786,845 A (TSURIA) 28 July 1998 whole document	8-13
A	US 5,233,423 A (JERNIGAN et al.) 03 August 1993 whole document	8-13
A	US 5,805,974 A (HITE et al.) 08 September 1998 whole document	8-13

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	* I* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
* A* document defining the general state of the art which is not considered to be of particular relevance	* X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
* B* earlier document published on or after the international filing date	* Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
* L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	* Z* document member of the same patent family
* O* document referring to an oral disclosure, use, exhibition or other means	
* P* document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

16 JUNE 2000

Date of mailing of the international search report

01 AUG 2000

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